

AD-A151 998

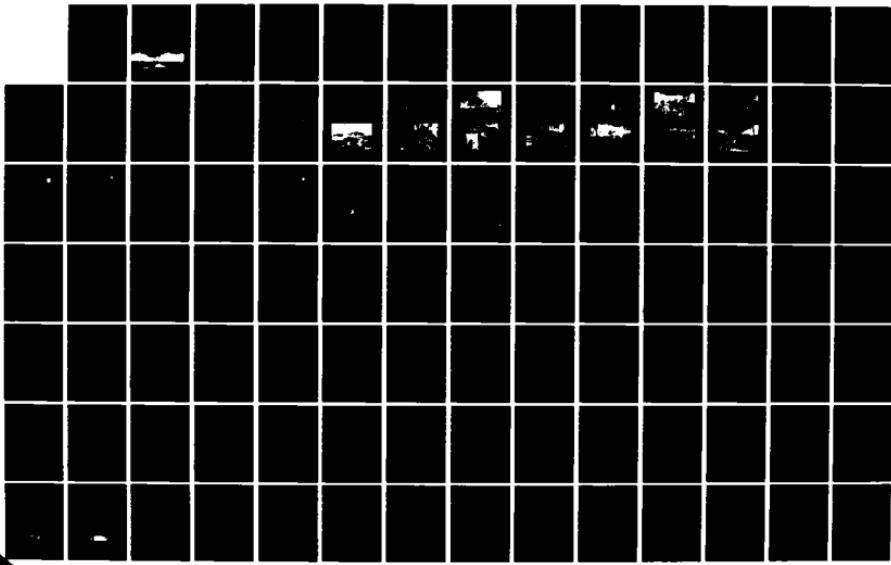
KOOTENAI CANYON ARCHAEOLOGY THE 1979 LAIRD (LIBBY  
ADDITIONAL UNITS AND REREGULATING DAM) PROJECT(U)  
MONTANA STATE UNIV BOZEMAN DEPT OF SOCIOLOGY T E ROLL

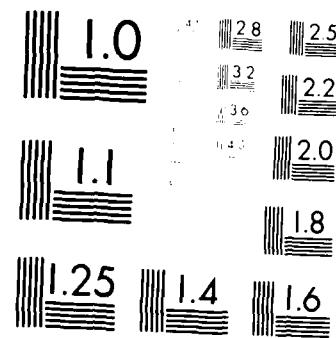
UNCLASSIFIED 1982 DACW67-79-C-0072

1/2

F/G 5/6

NL





MICROCOPY RESOLUTION TEST CHART  
NATIONAL BUREAU OF STANDARDS

AD-A151 998

# KOOTENAI CANYON ARCHAEOLOGY

## THE 1979 LAURD PROJECT FINAL MITIGATION REPORT

TOM E. ROLL, ed.

APR 2 1982

A

1  
2

FILE COPY  
MNR

MONTANA STATE UNIVERSITY, Bozeman

1982

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) Kootenai Canyon archaeology the 1979 Laurd Project final mitigation report.		5. TYPE OF REPORT & PERIOD COVERED final
7. AUTHOR(s) Roll, Tom E.		6. PERFORMING ORG. REPORT NUMBER DACPW67-79-C-0072
9. PERFORMING ORGANIZATION NAME AND ADDRESS U.S. Army Corps of Engineers Seattle District; P.O. Box C-3755 Seattle, WA 98124		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS		12. REPORT DATE 1982
		13. NUMBER OF PAGES
14. MONITORING AGENCY NAME & ADDRESS(if different from Controlling Office)		15. SECURITY CLASS. (of this report)
		15a. DECLASSIFICATION DOWNGRADING SCHEDULE
16. DISTRIBUTION STATEMENT (of this Report)		
17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)		
18. SUPPLEMENTARY NOTES		
19. KEY WORDS (Continue on reverse side if necessary and identify by block number) Kootenai Canyon, Montana Libby Dam, Montana LAURD Project Kootenai River, Montana		
20. ABSTRACT (Continue on reverse side if necessary and identify by block number) The 1979 Libby Additional Units and Reregulating Dam (LAURD) cultural resources project was designed to excavate archaeological sites endangered by proposed dam construction. The project area is located in the narrow "V" shaped canyon of the mid-Kootenai River region of northwestern Montana. This transmontane setting resulted in an aboriginal subsistence adaptation that reflected the comparative absence of staple resources such as camas, anadromous fish, caribou and bison that prevailed in surrounding areas. The native people of the mid-Kootenai emphasized exploitation of deer during periods of seasonal abundance. Populations concentrated		

in the river bottoms (late winter-early spring) and dispersed at other times.

Correlation of the geological and palynological records with available radiocarbon dates and typological cross-dating with established projectile point chronologies from adjacent areas suggest the presence of six sequent phases in the floodplain setting of the LAURD project area.

Despite climatic and vegetative changes, the subsistence systems of the last 6000 years appear essentially similar. The versatility of the preferred prey species was sufficient to dampen the effects of the indicated climatic-vegetative changes. The diverse topography of the mid-Kootenai River region would provide habitat similar to that available today but at different elevations or in different exposures.

**KOOTENAI CANYON ARCHAEOLOGY**

**THE 1979 LAURD PROJECT**

**FINAL MITIGATION REPORT**

Edited by

Tom E. Roll

A Report in Partial Fulfillment of Contract No. DACW67-79-C-0072  
Seattle District, U. S. Army Corps of Engineers

The technical findings and conclusions contained in  
this report do not necessarily reflect the views or  
concurrence of the sponsoring agency.

Department of Sociology

Montana State University

Bozeman

1982

#### ACKNOWLEDGMENTS

The involvement of Montana State University with the Libby Additional Units and Reregulating Dam cultural resource management project began through negotiations with David A. Munsell, U. S. Corps of Engineers staff archaeologist with the Seattle District. Initial negotiations began in January 1979, and a contract was received in May 1979. Munsell acted as contract manager for the Corps until mid-summer 1979. Dorothy E. Hall and Charlotte L. Benson assumed the duties of Corps contract manager for intervals between autumn 1979 and autumn 1980. David G. Rice became the contract manager in early 1981 and has provided a source of contract continuity since that time. His experience and professionalism have been of considerable benefit. Dr. Steven F. Dice served as the contracting officer's representative for the duration of the project. Other members of the Seattle District Corps office that have been involved with the LAURD project at various levels were Lawr Salo and Jonnathan Maas. The efforts of Mr. Maas in arranging transportation of trailer accommodations to their appointed destination at the LAURD project area and fighting a multitude of small but frustrating battles concerning their placement are most gratefully acknowledged.

Corps personnel associated with the Libby Dam provided assistance throughout the field portion of the project. The Resident Engineer, Ernest G. Moon, showed continued interest and support of the project. Ms. Agnes M. Davidson, Administrative Assistant, aided us immeasurably by providing access to drafting tables, desks and other items that would have been either difficult or impossible to move from Bozeman to the field headquarters. John W. Davidson, Maintenance Engineer, could be called upon to provide service to the Corps-owned trailer units at virtually any time. His efforts at replacing broken water pipes before our arrival and at winterizing the units before deep winter set in were both accomplished under less than ideal conditions. Mr. Davidson's interest in both the people and the project will always be deeply appreciated.

The proprietor of Blackwell's Trailer Court, Lewis Blackwell, rented us space for 10 trailer houses and the old court Community Hall, which served admirably as kitchen, dining hall, and field laboratory. "Old John" Miller, longtime resident of the trailer court, aided the crew in many ways. He sharpened saws, knives, and axes; he built screen frames, kitchen counters, and cutting boards; he befriended nearly every member of the crew.

The participants in the project also deserve a few notes of recognition. It is unfortunate that there were so many involved in the project over such a brief interval for the names of most of them will be passed over. Mr. James Wyss acted as field director during the field phase of the project. Pamela Liggett, Jared K. Funk, and James Peterson served as crew chiefs at 24LN1125. David Pollock was in charge of excavations at 24LN1029, and Funk and Peterson shared duties at 24LN1124. Gary Buck was project photographer throughout the summer of 1979. In fall, 1979, Jered Funk assumed the position of

assistant field director. Carol Hanchette was responsible for most of the work at 24LN1020, Niki Clark directed the testing of 24LN10, 24LN1051, and 24LN1123, and Pamela Liggett and James Peterson shared responsibilities for the work at 24LN528. In many respects Pamela had a most difficult task as she was assigned the job of aiding where she was needed and she worked as director on more than one site or area during each phase of the project. Ron Savage assumed the duties of project photographer during the autumn of 1979 and carried through to produce proof prints after the project was completed. To the unmentioned excavators and laboratory aids goes my thanks for good work.

William L. Singleton was laboratory director throughout the project and much of the writing of this descriptive report fell to him. Marilyn Bailey was assistant laboratory director for the duration, her persistence and dedication is most gratefully acknowledged. Faunal analysis was performed by Craig Henry with aid from Weber T. Greiser and Michael Wilson when available comparative collections proved inadequate. The project coordinator, Linda Coleman, whose job it was to see that all field notes were correct and filed at the end of each day certainly deserves some applause. Mary Collins, laboratory technician, and Craig Henry, faunal analyst, were a source of continuity between this and the earlier University of Idaho LAURD project.

Bruce Cochran and Frank C. Leonhardy undertook the stratigraphy and geomorphology of the LAURD project area with the help of the "strat rats" Rich Glaser and Jim Hampson. Their help was invaluable to our understanding of the sites' contents.

Richarn N. Mack agreed to perform palynological investigations in the LAURD area. Members of his team included M. Bechard, P. A. Bookman, D. Cartwright, D. A. Pyke, and J. N. Thompson who assisted in extracting the cores from both sites. S. Bookman assisted in the pollen sample extractions. The participation of these people is truly appreciated.

At Montana State University Larry Kain, Administrator of Grants and Contracts, provided a crucial interface between the Corps of Engineers and the University. The head of the Department of Sociology, Dr. David A. Fabianic, provided encouragement and more importantly, leave time during times when it appeared that the project would never be completed. Dr. C. Jack Gilchrist, of the Center for Social Data Analysis, and his colleagues Cel Allard and Robert Hunter provided advice and their expertise on the computer to generate custom programming for the project.

Marc Smith is responsible for all of the drafting on the LAURD project reports, this report as well as the monthly reports, the annual report, and the yet to be presented final mitigation report. In addition to his drafting, Marc participated in the editorial process of this report and added his thoughts and talents to its production.

Tom E. Roll  
Principal Investigator

## ABSTRACT

The 1979 Libby Additional Units and Reregulating Dam cultural resources project, sponsored by the U. S. Army Corps of Engineers, was designed to excavate archaeological sites endangered by proposed dam construction and associated effects that could not be mitigated by other measures. The LAURD project area is located in the narrow "V" shaped canyon of the mid Kootenai-River Region of northwestern Montana. While physiographically an extension of the Northern Columbia Plateau Archaeological Area, this transmontane setting resulted in an aboriginal subsistence adaptation that reflected the comparative absence of staple resources such as camas, anadromous fish, caribou, and bison that prevailed in surrounding areas. The native people of the mid-Kootenai emphasized exploitation of deer during periods of seasonal abundance. Populations concentrated in the river bottoms (late winter - early spring) and dispersed at other times to utilize the variable resource potential of additional life zones.

Geomorphological and palynological studies performed as adjuncts to the archaeological project amplified the available information. Studies of geomorphology recorded Late Quaternary glacial terraces, landslides, construction and erosion of river terraces, alluvial fans, mid-channel bars, and mudflow features. At intervals in the past high flood waters planed the older terraces in most places and pre-Mazama ashfall (ca. 6700 BP) sediments rarely contain developed soils or relic surfaces. In fact, buried "A" horizons, where cultural materials might be expected to be preserved, are most frequently found on alluvial surfaces that post-date 3500 BP.

The palynological records from Tepee Lake and McKillop Creek Pond, bogs immediately south of the LAURD project area, reveal five major intervals of pollen influx indicative of climatic and vegetative episodes. Pollen Zones I (>11,000 BP) and II (11,000 - 7,000 BP) reveal a climate both cooler and moister than at present with heavy increases in sages during Zone II. Pollen Zone III (7,000 - 4,000 BP) is represented by species that indicate a climate both warmer and drier than at present. Pollen Zone IV (4,000 - 2,500 BP) indicates a climatic reversal to conditions somewhat cooler and moister than exist today. Pollen Zone V (2,500 BP - Present) represents the arrival of essentially modern climatic conditions and the succession to modern vegetation.

Correlation of the geological and palynological records with available radiocarbon dates and typological cross-dating with established projectile point chronologies from adjacent areas suggest the presence of six sequent cultural phases in the floodplain setting of the LAURD project area. Both the putative Bristow (5500 - 4500 BP) and the somewhat more firmly identified Calx (4500 - 3300 BP) Phases are infrequently represented. Either the people of these phases did not occupy the area frequently, they focused on other zones, or their remains are not well represented in the infrequently preserved surfaces of those ages. The Kavalla Phase (3300 - 1800 BP) appears to represent a fully developed regional subsistence system. The

Stonehill Phase (1800 -1300 BP) is indicative of the previous Kavalla Phase subsistence system with minimal changes in the projectile system. The Warex Phase (1300 - 800 BP) introduces the bow and arrow to the region and with slight alteration in projectile point morphology the Yarnell Phase (800 - 100 BP) documents the final expression of the prehistoric era in the Kootenai Region.

Despite climatic and vegetative changes, the subsistence systems of the last 6000 years appear essentially similar. The versatility of the preferred prey species was sufficient to dampen the effects of the indicated climatic-vegetative changes. The diverse topography of the mid-Kootenai River Region would provide habitat similar to that available today but at different elevations or in different exposures.

## TABLE OF CONTENTS

	Page
ACKNOWLEDGMENTS . . . . .	ii
ABSTRACT . . . . .	vi
LIST OF TABLES . . . . .	ix
LIST OF ILLUSTRATIONS . . . . .	x
1. INTRODUCTION TO THE LAURD PROJECT . . . . .	1.1
Purpose . . . . .	1.1
Geographic Divisions . . . . .	1.10
Assumptions and Models . . . . .	1.21
Model Building . . . . .	1.23
Applicable Models . . . . .	1.24
Models for the Kootenai Region . . . . .	1.26
Test of an Hypothesis . . . . .	1.26
Other Hypotheses . . . . .	1.27
Alternative Models . . . . .	1.29
Goals and Approach . . . . .	1.33
The Field Effort . . . . .	1.35
Emphasis of the Study . . . . .	1.36
2. HOLOCENE GEOLOGY AND GEOMORPHOLOGY AND STRATIGRAPHY OF THE LAURD PROJECT AREA . . . . .	2.1
Introduction . . . . .	2.1
Geologic Setting . . . . .	2.1
Geologic Units . . . . .	2.2
Late Quaternary Geomorphology . . . . .	2.3
Glacial Terraces . . . . .	2.3
Landslides . . . . .	2.4
River Terraces . . . . .	2.5
Alluvial Fans . . . . .	2.6
Islands or Mid-Channel Bars . . . . .	2.6
Mudflow Features . . . . .	2.6
Late Quaternary Stratigraphy . . . . .	2.7
Late Pleistocene Deposits . . . . .	2.7
Glacio-fluvio-lacustrine Deposits . . . . .	2.7
Late Pleistocene Sands and Gravels . . . . .	2.11
Landslide Debris . . . . .	2.12
Holocene Deposits . . . . .	2.12
Flood Plain Alluvium . . . . .	2.12
Early Holocene Alluvium . . . . .	2.12
Alluvial Fan Gravels . . . . .	2.13
Early Middle Holocene Alluvium . . . . .	2.13
Late Holocene Alluvium . . . . .	2.14
Holocene Mudflow Deposits . . . . .	2.14
Summary . . . . .	2.14
Correlation of Archaeological Sites . . . . .	2.15

	Page
Radiocarbon Dates . . . . .	2.15
Soils . . . . .	2.16
Volcanic Ash . . . . .	2.17
Summary . . . . .	2.18
Site Correlations . . . . .	2.21
<b>3. POLLEN ANALYSIS OF CORES FROM TEPEE LAKE AND McKILLOP CREEK POND, LINCOLN COUNTY, MONTANA . . . . .</b>	<b>3.1</b>
Introduction . . . . .	3.1
Modern Climate and Vegetation . . . . .	3.2
Methods . . . . .	3.3
Pollen Zone Sequence . . . . .	3.5
Pollen Zone I . . . . .	3.5
Pollen Zone II . . . . .	3.5
Pollen Zone III . . . . .	3.8
Pollen Zone IV . . . . .	3.8
Pollen Zone V . . . . .	3.8
Preliminary Environmental Interpretations . . . . .	3.9
<b>4. TOWARD A MODEL OF PREHISTORIC SUBSISTENCE IN THE CANYON LOCALITY OF THE KOOTENAI RIVER REGION . . . . .</b>	<b>4.1</b>
Introduction . . . . .	4.1
Procedures . . . . .	4.2
Species Present . . . . .	4.3
Population Density . . . . .	4.3
Caloric Content . . . . .	4.3
Harvest Levels . . . . .	4.5
Non-mammalian Resources . . . . .	4.6
Daily Human Caloric Requirements . . . . .	4.6
Persondays . . . . .	4.7
Human Population . . . . .	4.7
Results . . . . .	4.7
Discussion . . . . .	4.8
Resource Utilization Strategies . . . . .	4.10
A consideration of the resource base . . . . .	4.10
Economically Significant Plants . . . . .	4.13
Bitterroot . . . . .	4.13
Serviceberry, Huckleberry, and Chokecherry .	4.14
Black Moss . . . . .	4.15
Animal Resources . . . . .	4.16
Fish . . . . .	4.16
Birds . . . . .	4.17
Mammals . . . . .	4.17
Hunting Strategies . . . . .	4.18
Deer Hunting . . . . .	4.18
Compatibility with the archaeological record .	4.19
Conclusions . . . . .	4.20
Summary . . . . .	4.21

	Page
5. A PROVISIONAL CULTURAL-HISTORICAL OUTLINE OF KOOTENAI REGION PREHISTORY . . . . .	5.1
Introduction . . . . .	5.1
Approaches to Order . . . . .	5.2
Previous Regional Typologies . . . . .	5.4
The Cultural Typology . . . . .	5.5
Framework and Definition of Terms . . . . .	5.5
The Local Sequence . . . . .	5.7
External Comparisons . . . . .	5.23
Summary . . . . .	5.30
6. EPILOGUE . . . . .	6.1
REFERENCES CITED . . . . .	R.1

LIST OF TABLES

Table		Page
1.1.	Hierarchy of spatial divisions in the Northern Plateau	1.20
1.2.	Area and volume excavated during 1979 by site . . . . .	1.36
1.1.	Volcanic glass element analysis . . . . .	2.20
2.1.	Relative atomic weight and percentages of Calcium (CaO), Iron (FeO) and Potassium (K <sub>2</sub> O) oxides of volcanic glass separates from 24LN1125, Area A, pit 776 . . . . .	2.21
3.1.	Radiocarbon dates from Tepee Lake and McKillop Creek Pond. . . . .	3.4
4.1.	Potential of prominent Kootenai Region mammals to contribute to the aboriginal diet . . . . .	4.4
4.2.	Caloric values per gram of meat for various mammalian orders . . . . .	4.5
4.3.	Potential persondays represented by caloric availability of the total mammalian component and indicated percentages of plant and fish supplements @ 3000 kcal/person/day. . . . .	4.6
4.4.	Human population potential of total mammalian resource base compared to that of archaeologically documented mammalian resources for various lengths of occupation .	4.8
4.5.	Potential human population supportable from sites excavated in 1979 LAURD project . . . . .	4.9
5.1.	Approximate chronological order of climatic, vegetative and geomorphic events . . . . .	5.8
5.2.	Distribution of projectile points affiliated with the Galt Phase . . . . .	5.12
5.3.	Distribution of projectile points affiliated with the Favaillia Phase . . . . .	5.13
5.4.	Distribution of projectile points affiliated with the Stonehill Phase . . . . .	5.16
5.5.	Distribution of projectile points affiliated with the Warez Phase . . . . .	5.18
5.6.	Montana radiocarbon dates for Avonlea and Varex Phases.	5.18
5.7.	Distribution of projectile points affiliated with the Farrell Phase . . . . .	5.22

Columbia and Fraser rivers. Most of the Snake and Salmon rivers in Idaho and the extreme upper reaches of the Fraser River are excluded from the area. Culture areas that surround the Columbia-Fraser Plateau culture area include the Northwest Coast culture to the west of the Cascade range, the Great Basin to the south, the Great Plains to the east, and the Western Subarctic to the north. Traditionally, the native inhabitants of western Montana, northern Idaho, and British Columbia have been considered to exhibit cultural traits that indicated participation in a lifestyle more in keeping with the Interior Plateau than any of the surrounding culture areas.

Archaeologists who have focused their attention on the Columbia Plateau seem inclined to define southern and northern Plateau archaeological areas (Caldwell and Mallory 1967:80). This practice would presumably also grant areal status to the Fraser Plateau. Kroeber divided his Columbia-Fraser Plateau into three provinces, the Fraser and Upper and Middle Columbia. From an ethnographic perspective Kroeber's provinces might prove useful, but both the Middle and Upper Columbia provinces exhibit pronounced internal differences both environmentally and culturally. The southern Plateau archaeological area encompasses most of Kroeber's Middle Columbia province, but adds a substantial portion of the Snake and Salmon River drainages. The boundary between the southern and northern archaeological areas will undoubtedly remain ephemeral, but the northern periphery of the Channeled Scablands where they abut the valley of the Columbia River provides a convenient referent that seems to equate with observed differences in archaeological assemblages. The northern Plateau archaeological area includes most of the terrain drained by south and westerly flowing tributaries of the Columbia River. These include the Okanogan, Nespelem, Sanpoil, Spokane, Pend Oreille, and Kootenai River drainages as well as other smaller streams (Fig. 1.15).

Within the northern Plateau archaeological area we can identify at least three relatively neat physiographic units that fit the Willey and Phillips concept of a subarea. Subareas are spatial units "... of geographic extent intermediate between the region and the area which possess qualities and degrees of cultural unity that give them a definite usefulness in archaeological or ethnographic studies [1958:20]." One subarea consists of the entire drainage of the Okanogan and associated Columbia River tributaries. The drainage of the Columbia River north of the mouth of the Spokane River but excluding most of the drainages of the two major northern tributaries, the Pend Oreille and Kootenai rivers, forms a second subarea. The Okanogan and Columbia Headwaters seem appropriate nomen for these subareas. The third subarea will be referred to as the Barrier Falls subarea. The Barrier Falls subarea consists of the entire drainages of the Kootenai River upstream from Bonnington Falls and the Pend Oreille River above Metaline Falls (Fig. 1.16).

The continental divide from the Headwaters of the Saskatchewan, Columbia, and Kootenay rivers in Canada to the Headwaters of the Bitterroot River in southwestern Montana defines the eastern and southern boundaries of the Barrier Falls subarea. From the continental divide near the Headwaters of the Bitterroot River north

## GEOGRAPHIC DIVISIONS

For generations, anthropologists have recognized that the environment in which a culture operates "conditions" the cultural response. At any given exploitative level (hunter, farmer, industrialist), the environment limits or enhances the nature of cultural responses. The interaction of the cultural system with the natural system is one of the many problems anthropology commonly attempts to address (cf. Steward 1955:30-42). In essence, people who practice a particular subsistence technology often share many of the attributes of the technology with others who earn their living in a similar way. This commonality of subsistence accoutrements is frequently pronounced among people who utilize similar environments, particularly when they occupy adjacent terrain. We expect hunters and gatherers who live in the Pacific northwest to share more of their cultural practices with one another than either would with a hunter-gatherer from a desert or arctic habitat. We would also anticipate that those same groups of Pacific northwest hunter-gatherers would share more traits in common than would either with the modern industrial community or the earlier agricultural community of that same region.

Recognition of the many shared aspects of culture that peoples living in the same geographic area often exhibit led to the development of the "culture area" concept. American anthropologists spent some four or five decades during which classification and comparison of native American cultures focused on one form or another of the culture area concept. It was used both as the sole means of classification and a convenient ancillary device (cf. Sapir 1916, Wissler 1917, and Kroeber 1963). Although developed to compare ethnic entities in the same or similar areas, the culture area concept was soon applied to archaeological manifestations as well (Wissler 1917:363). Most archaeological cultural classificatory schemes have depended to some extent on geographic referents. At least one system that explicitly excluded the spatial (and chronological) dimension, the so-called McKern or Midwestern Taxonomic System (McKern 1939), soon fell prey to the introduction of geographic nomenclature and designations.

One attempt to create an integrated cultural classificatory scheme explicitly includes the spatial dimension along with the dimensions of culture content and time. Willey and Phillips (1958) recognize the importance of geographical location and the associated environmental implications and provide a set of spatial divisions or units. These units are, from the smallest to the largest, site, locality, region, subarea, and area. The area, as described by Willey and Phillips (1958:20), corresponds to the culture area as used by ethnographers. It tends "to coincide with major physiographic divisions."

The Columbia-Fraser Plateau culture area defined by Kroeber (1963:55-57) corresponds closely to the archaeological area identified by Willey as the Interior Plateau area (1966:396-398) and by Jennings (1974:182-189) simply as the Plateaus. The Interior Plateau area includes most of the territory within the drainage basins of the

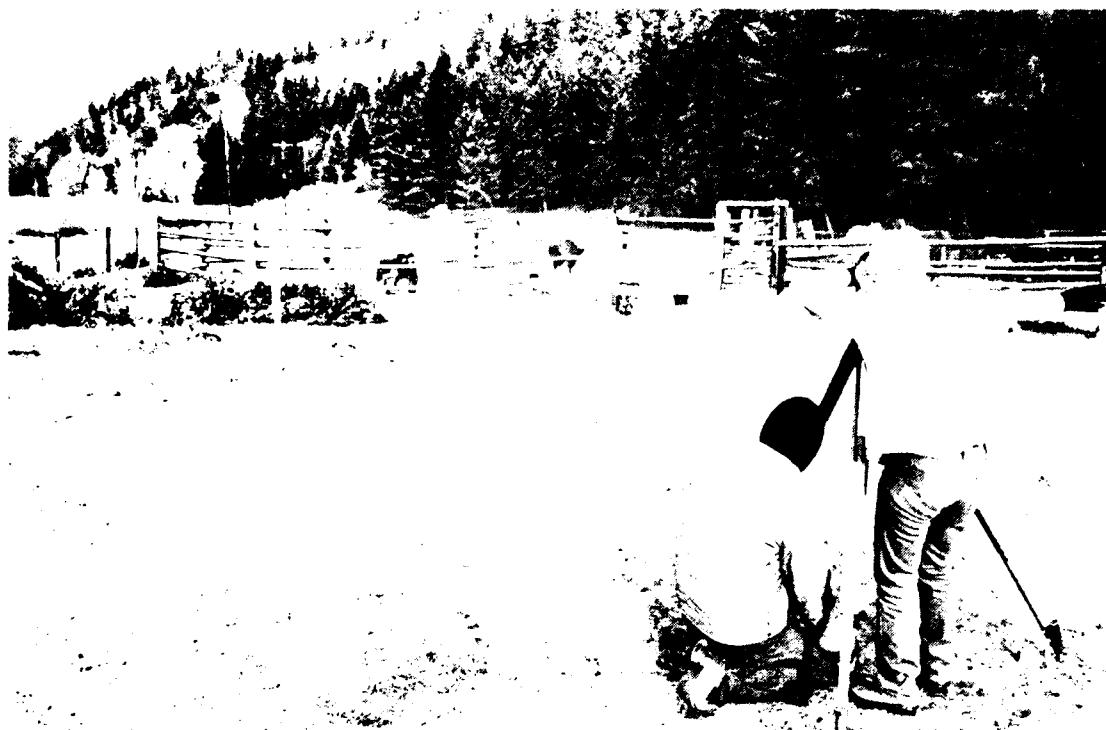


Figure 1.13. Testing at 24LN1051.

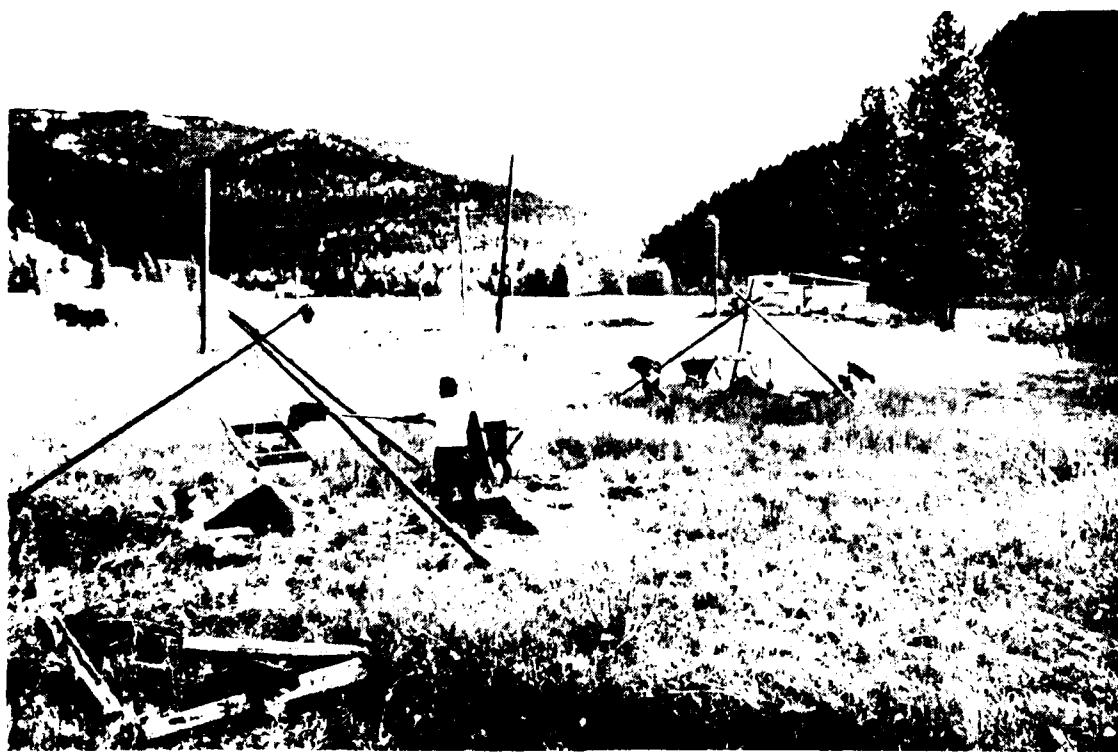


Figure 1.14. Test excavations at alternate test site 24LN1123.



Figure 1.11. Establishing the testing grid on 24LN10.

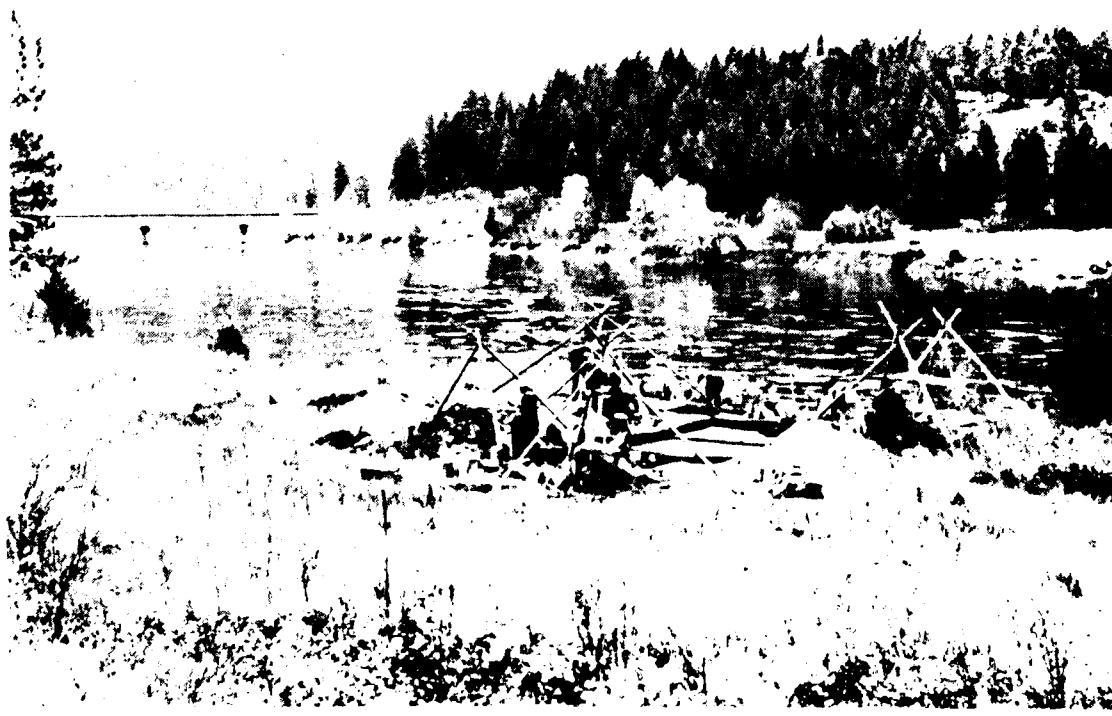


Figure 1.12. Test excavation at 24LN10.



Fig. 1. High terrace setting of 24LN1020 with exploratory trenches cross-cutting open terrace.



Fig. 2. Two archaeologists at work in a deep, narrow trench on downstream portion of 24LN1020.



Figure 1.7. Trenched terrace containing archaeological site 24LN528.



Figure 1.8. Major excavation block, Area B, 24LN528.



Figure 1.5. Mid-channel island location of 24LN1029.



Figure 1.6. Fire-broken rock feature in Area A, 24LN1029.

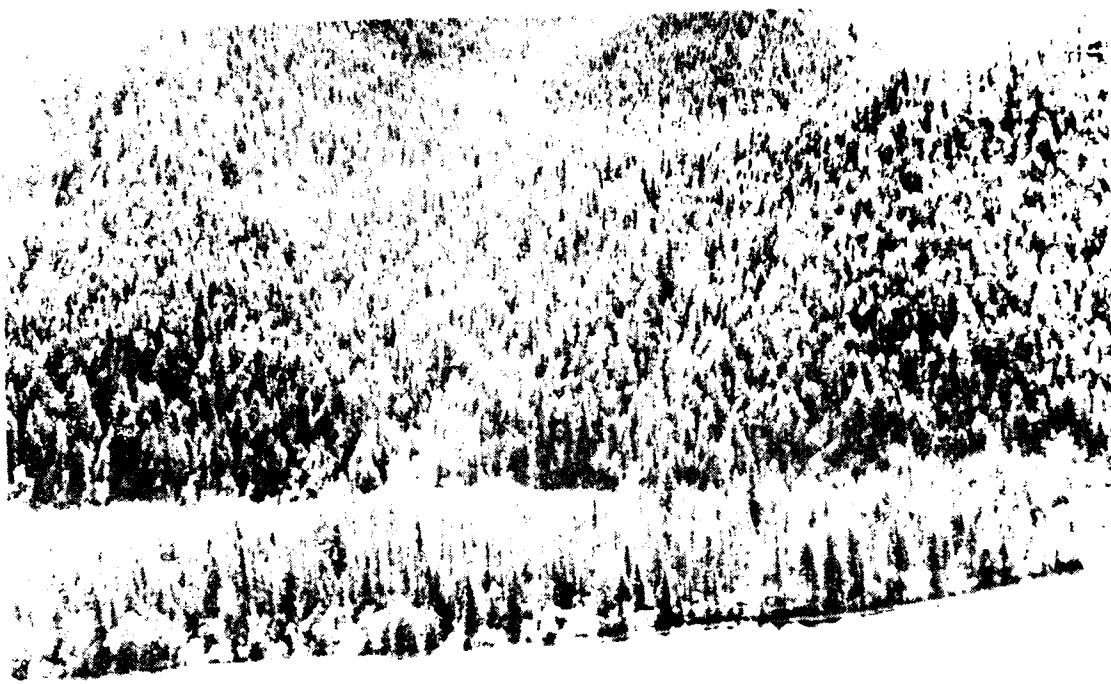


Figure 1.3. Terrace location of 24LN1125 (mudflow visible in center).



Figure 1.4. Fire-broken rock midden in Area E, 24LN1125.

The order of excavation was determined by the immediacy of construction project effect; those sites in the most immediate danger of modification were excavated first. The first site mitigated, 24LN1036, was excavated by the U of I in 1978. Three sites (24LN1124, Fig. 1.2; 24LN1125, Fig. 1.3 and 1.4; and 24LN1029, Fig. 1.5 and 1.6;) on the left bank of the river were selected for excavation during the summer of 1979. The fall of 1979 was dedicated to excavation of two additional sites (24LN528, Fig. 1.7 and 1.8, and 24LN1020, Fig. 1.9 and 1.10), extensive testing of one (24LN10, Fig. 1.11 and 1.12), and limited tests of two more (24LN2 and 24LN1051). Ultimately, refusal of the property owner to grant access to 24LN2 resulted in tests at 24LN1123, a downstream extension of 24LN2. The limited tests at both 24LN1051 (Fig. 1.13) and 24LN1123 (Fig. 1.14) produced essentially negative results (24LN1051 had only limited cultural material present, 24LN1123 was badly disturbed by historic activity and had limited cultural debris). Detailed results of tests at 24LN1051 and 24LN1123 were provided to the Corps of Engineers by letter and will not receive further consideration in this discussion.

The five sites excavated (24LN528, 24LN1020, 24LN1029, 24LN1124 and 24LN1125) and the one site that was extensively tested (24LN10) as the major focus of the 1979 LAURD Cultural Resources Project have already been reported in the "Descriptive Archaeology of the 1979 LAURD Project" (Roll and Smith 1982). The purpose of this report is to place the archaeological materials described in "Descriptive Archaeology of the 1979 LAURD Project" in a more synthetic, comparative framework.



Figure 1.2. Excavations in high terrace site, 24LN1124.

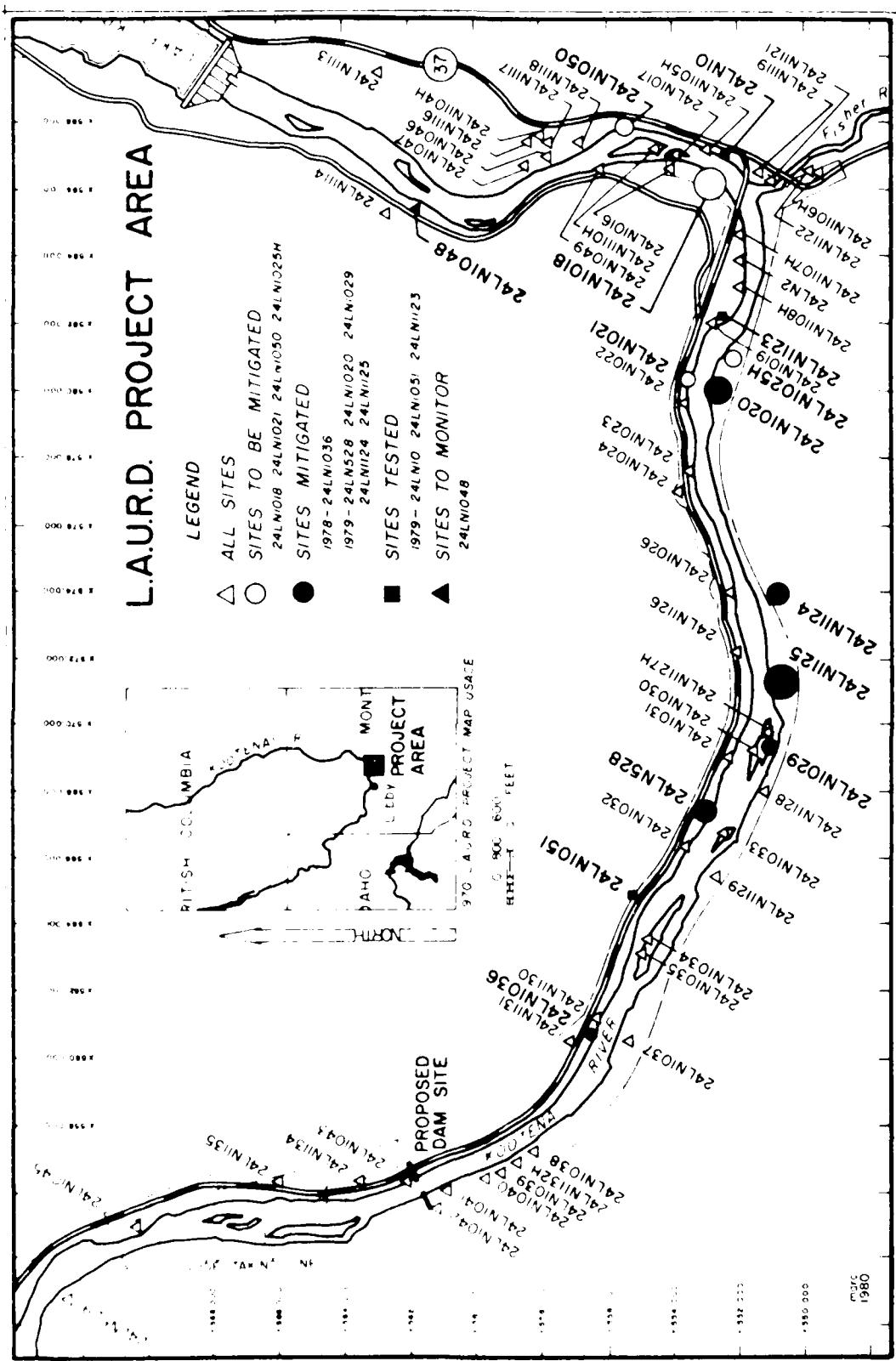


Figure 1.1. LAURD project area in northwestern Montana.

## 1. INTRODUCTION TO THE LAURD PROJECT

by

Tom E. Roll and William L. Singleton

### PURPOSE

The 1979 Libby Additional Units and Reregulating Dam (LAURD) archaeological project was initiated by the U. S. Army Corps of Engineers as an extension of previous Corps sponsored archaeology necessitated by plans to install the reregulating dam on the Kootenai River at river mile 208.9, about 10 miles downstream from Libby Dam (see Fig. 1.1). The project area lies within the great bend of the Kootenai River a short distance upstream from Libby, the seat of Lincoln County, the northwesternmost county of Montana. The project would involve construction of the reregulating dam and the addition of four generating units at the Libby Dam powerhouse, inundation of approximately 900 acres of bottomland, and relocation of 8.8 miles of Burlington Northern Railroad (BNRR), 7 miles of Montana State Highway (MSH) 37, 0.5 miles of U.S. Forest Service (USFS) Forest Development Road 92.7, 7.5 miles of St. Regis Timber Company haul road, and sewage treatment facilities at the USFS Canoe Gulch Ranger Station. The zone of impact would encompass a total of 1,890 acres (Munsell and Salo 1979:1-2).

Previous archaeological reconnaissance of the LAURD project area had located a total of 43 prehistoric and 9 historic cultural resource sites within the reregulating reservoir project area (Fig. 1.1) (Munsell and Salo 1979:3-1). A program of survey and testing initiated by the University of Idaho (U of I) under contract to the Corps of Engineers during 1977-78 resulted in a total of 297 hand excavated tests (mostly 1x2 m) in 37 prehistoric sites.

As with most salvage projects a series of decisions that influenced the course of excavations were made before the 1979 LAURD archaeological project began. Available time and finances would permit additional tests in most sites, exhaustive excavation of one or two, or relatively intensive excavation of a select sample. Using information from the U of I testing program of 1977-78, Corps archaeologists (Munsell and Salo 1979) constructed a variability matrix that permitted assessment and comparison of all sites. Information entered into the variability matrix included number and kind (chronological placement) of components and intensity of occupation (density of fire-broken rock, lithic detritus, and bone by  $\text{g}/\text{m}^3$ ). Non-cultural parameters consisted of environmental contexts (direction of solar exposure, elevation above mean river surface, and proximity to auxiliary water sources). In addition to the variability matrix the nature of project effect on the site (whether it could be avoided or mitigated by preservation rather than excavation) and the presumed integrity of the site's prehistoric deposits (whether disturbed or not) were considered. From the pool of relatively intact but endangered prehistoric sites that exhibited a cross-section of the variability matrix attributes, ten were selected for excavation.

Figure	Page
5.12. Projectile points of the Stonehill Phase. . . . .	5.16
5.13. Type 3 projectile point . . . . .	5.17
5.14. Type 2 projectile point . . . . .	5.17
5.15. Projectile points of the Warex Phase. . . . .	5.19
5.16. Type 1-A projectile point . . . . .	5.20
5.17. Type 1-B projectile point . . . . .	5.21
5.18. Projectile points of the Yarnell Phase. . . . .	5.21
5.19. Percentage contribution of phase affiliated projectile points by total assemblage and by individual site . . .	5.23
5.20. Selected archaeological sequences of the northern transmontane west . . . . .	5.27
5.21. Miscellaneous tools from the 1979 LAURD Project sites .	5.28
5.22. Miscellaneous tools from the 1979 LAURD Project sites .	5.29

Figure	Page
2.5. Generalized stratigraphic and geomorphic relationships of deposits in the LAURD project area . . . . .	2.11
2.6. Relative percentages of CaO, K <sub>2</sub> O, and FeO identified in Pacific Northwest volcanic ashes . . . . .	2.19
2.7. Correlation of Early to Late Holocene deposits at 24LN10, 24LN528, 24LN1020, and 24LN1125 . . . . .	2.22
2.8. Stratigraphic relationships of Early and Late Middle Holocene alluvium at 24LN1125 and 24LN1029. . . . .	2.22
2.9. Generalized stratigraphic cross-section at 24LN1020 (Jennings Terrace) . . . . .	2.24
2.10. Generalized stratigraphic cross-section at 24LN1125, Trench E, showing the relationship of Early to Late Holocene deposits and soils . . . . .	2.24
2.11. Stratigraphic sequence and relationships of Late-Middle and Late Holocene deposits. The uppermost unit at 24LN1124 is probably of late Holocene age. . . . .	2.25
3.1. Pollen sampling sites in Lincoln County, Montana. . . . .	3.2
3.2. Pollen percentage diagram from Tepee Lake, Lincoln County, Montana . . . . .	3.6
3.3. Pollen percentage diagram from McKillop Creek Pond, Lincoln County, Montana . . . . .	3.7
4.1. Distribution of prominent food resources of the northern transmontane west . . . . .	4.11
5.1. Type 11 projectile point. . . . .	5.9
5.2. Projectile points of the Bristow Phase. . . . .	5.10
5.3. Type 10 projectile point. . . . .	5.10
5.4. Type 9 projectile point . . . . .	5.11
5.5. Type 8 projectile point . . . . .	5.11
5.6. Projectile points of the Calx Phase . . . . .	5.11
5.7. Type 4 projectile point . . . . .	5.12
5.8. Type 5 projectile point . . . . .	5.13
5.9. Type 6 projectile point . . . . .	5.13
5.10. Projectile points of the Kavalla Phase. . . . .	5.14
5.11. Type 7 projectile point . . . . .	5.15

## LIST OF ILLUSTRATIONS

Figure	Page
1.1. LAURD project area in northwestern Montana . . . . .	1.2
1.2. Excavations in high terrace site, 24LN1124 . . . . .	1.3
1.3. Terrace location of 24LN1125 . . . . .	1.4
1.4. Fire-broken rock midden in Area E, 24LN1125 . . . . .	1.4
1.5. Mid-channel island location of 24LN1029 . . . . .	1.5
1.6. Fire-broken rock feature in Area A, 24LN1029 . . . . .	1.5
1.7. Trenched terrace containing archaeological site 24LN528	1.6
1.8. Major excavation block, Area B, 24LN528 . . . . .	1.6
1.9. Floodplain terrace setting of 24LN1020 with exploratory trenches cross-cutting open terrace . . . . .	1.7
1.10. Excavations underway on downstream portion of 24LN1020.	1.7
1.11. Establishing the testing grid on 24LN10 . . . . .	1.8
1.12. Test excavation at 24LN10 . . . . .	1.8
1.13. Testing at 24LN1051 . . . . .	1.9
1.14. Test excavations at alternate test site 24LN1123. . . .	1.9
1.15. Archaeological areas of the northwestern United States and southwestern Canada . . . . .	1.12
1.16. Subarea boundaries of the Northern Plateau Archaeological Area . . . . .	1.13
1.17. Regions of the Barrier Falls Subarea. . . . .	1.16
1.18. ERTS photography of Kootenai Region topography. . . . .	1.17
1.19. Defined Localities of the Kootenai Region . . . . .	1.19
2.1. Important landmarks in the LAURD project area . . . . .	2.1
2.2. Relationship of terraces and mid-channel islands in the LAURD project area. . . . .	2.3
2.3. Attributes of terrace formation at 24LN1125 and 24LN1020	2.6
2.4. Geologic units in the LAURD project area. . . . .	2.8

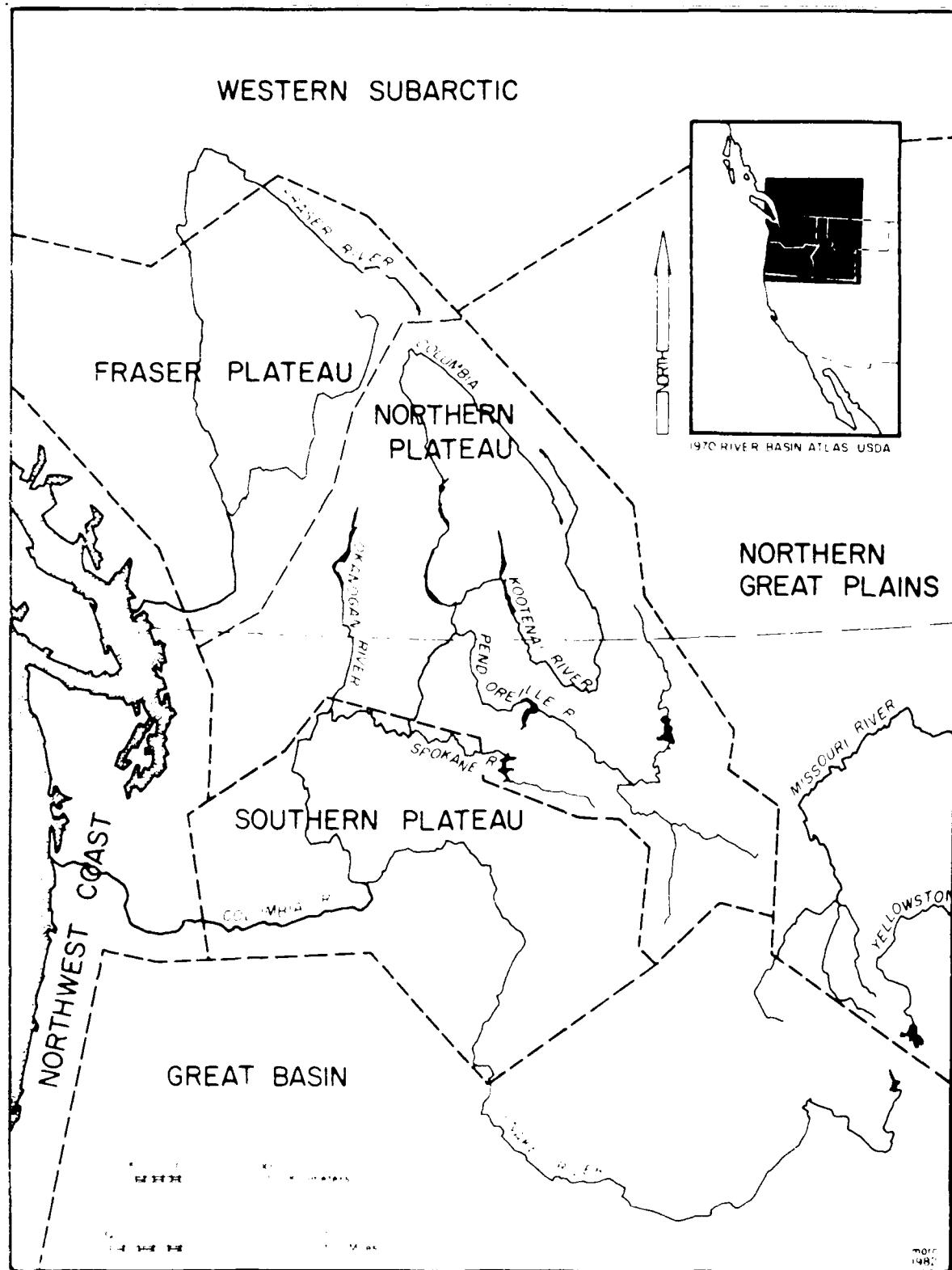


Figure 1.15. Archaeological areas of the northwestern United States and southwestern Canada.

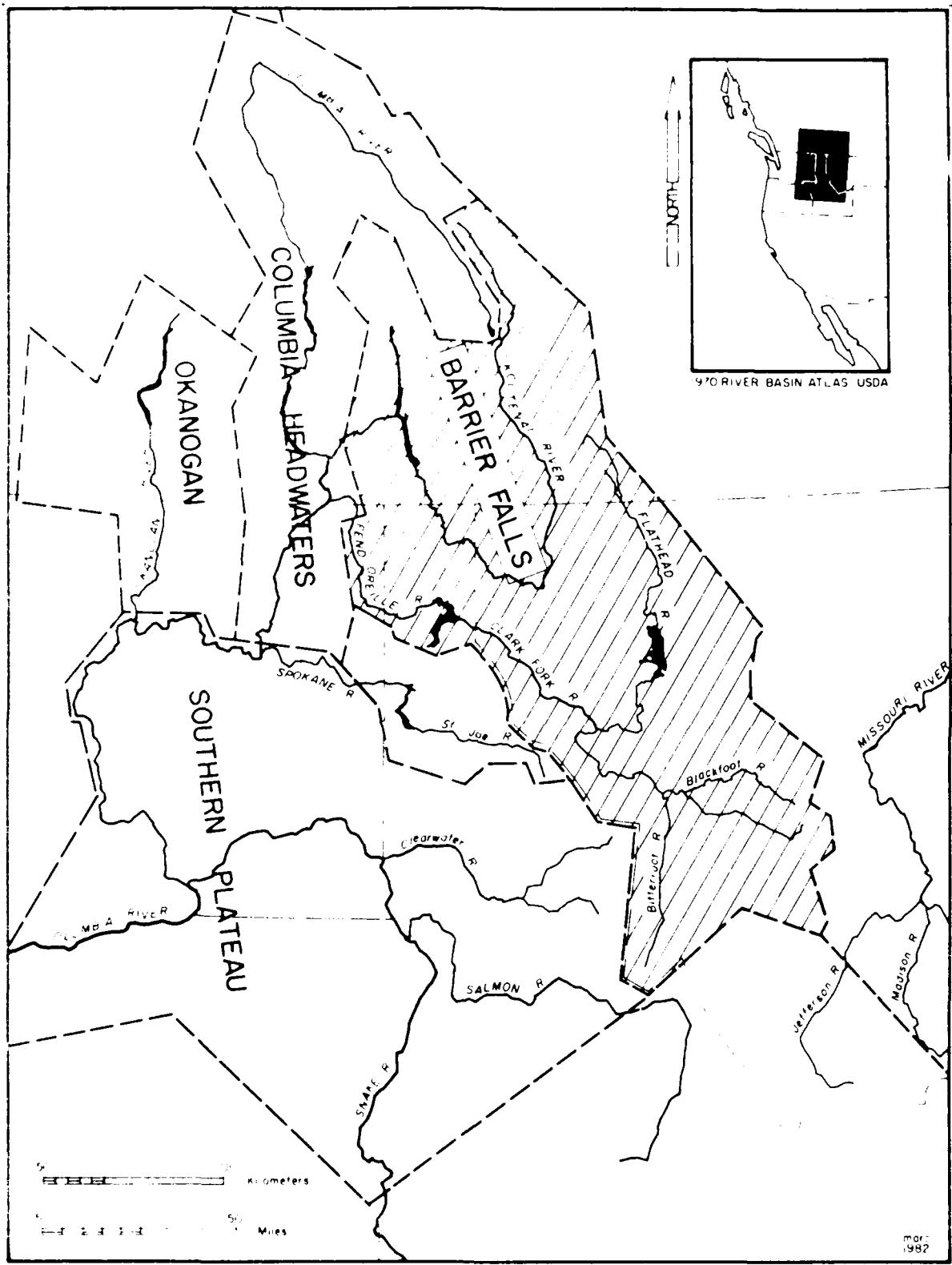


Figure 1.16. Subarea boundaries of the Northern Plateau archaeological area.

almost to Pend Oreille Lake, the divide of the Bitterroot range delineates the western boundary. From Pend Oreille Lake northward the subarea includes the drainage of the Pend Oreille River to Metaline Falls and the Kootenay River drainage upstream from Bonnington Falls.

The Barrier Falls subarea, as described, closely approximates in size and content Malouf's (1956) Montana Western region. A principal difference is the exclusion of the Columbia River proper from the subarea. We have chosen new terminology because of the provincial bias exhibited in the use of a state name for terrain that includes two states and lies on either side of an international boundary. Interestingly, the terrain we define as the Barrier Falls subarea is included by Wissler (1917) in his discussion of food areas as part of the salmon area. It is the total absence of this critical resource that led to the definition of the Barrier Falls subarea.

The principal variety of salmon to utilize the upper reaches of the Columbia were the Chinook (Oncorhynchus tshawytscha), probably of the spring run, who arrived in abundance during the last week in August or the first week in September (Bryant and Parkhurst 1950:104). Other anadromous species that may at one time have used the upper Columbia reaches were the Sockeye (O. nerka) and steelhead trout (Salmo gairdneri). Although there are no historic references to the presence of Sockeye in the far upper Columbia, the presence of landlocked Kokanee salmon in some of the Columbia River headwaters lakes argues for the possibility (Fulton 1970:24). No good evidence exists for the presence of Steelhead trout above the Arrow Lakes in British Columbia (Fulton 1970:3).

None of the anadromous species mentioned above occurred within the Barrier Falls subarea. Despite the possibility of occasional crossovers of fish from the Columbia Lake to the Kootenay River at Canal Flats during high water, none of the anadromous species apparently established themselves as landlocked species in the Kootenay River. Bonnington Falls, about 32 km upstream from the confluence of the Kootenay River with the Columbia, blocked fish migrations into Kootenay Lake and the Kootenay River. On the Pend Oreille River, Metaline Falls, again 32 km upstream from the mouth, also blocked the passage of fish upstream. The only additional major upstream tributary of the Columbia, the Spokane River, historically had runs of Chinook salmon that extended about 80 km upstream where the Spokane Falls barricaded the river against further migration (Fulton 1968:12).

When contrasted with the remainder of the Northern Plateau area or the Southern Plateau, the absence of salmon in the Barrier Falls subarea and the concomitant differences in the subsistence patterns of the resident cultures clearly justify subareal status. We feel confident that future archaeological investigations throughout the Northern and Southern Plateau areas will verify the utility of the Barrier Falls subarea as a contrast to the other portions of the Plateau areas.

The Barrier Falls subarea constitutes a substantial portion of the Northern Plateau area. Because of its mountainous setting,

considerable topographic and climatic diversity prevails throughout the subarea. Both flora and fauna respond to the topographic and climatic diversity and exhibit both annual and seasonal distributional differences in abundance and availability. Smaller units, more manageable than the subarea, reduce the extent of diversity that must be explained. The intermontane valleys of the Barrier Falls subarea provide convenient, readily identifiable units referable to as regions. Willey and Phillips (1958:19-20) treat regions in two distinct fashions. First, the region is viewed as an environmental-physiographic entity "... where physical conditions of sharp diversity prevail, archaeological regions are likely to coincide with minor physiographic subdivisions." Second, the region assumes the proportions of a social territory "... The region is roughly equivalent to the space that might be occupied by a social unit larger than the community, a unit to which we may with extreme trepidation apply the term 'tribe' or 'society'." They summarize by stating that the term region is applied to a "...geographical space in which, at a given time, a high degree of cultural homogeneity may be expected but not counted on."

The valley of the Kootenai River in Montana, Idaho, and British Columbia appears to meet the criteria of a region. It is physiographically divisible from the rest of the Barrier Falls subarea and in historic times comprised the principal range of a single ethnic entity, the Kutenai Indians. The Kootenai region will receive the major thrust of this discussion, but other valleys in the Barrier Falls subarea would provide equally viable archaeological regions. Valleys such as the Bitterroot Valley to the south, the Flathead Valley to the east, and the Deer Lodge Valley on the upper reaches of the Clark Fork River along the southeastern edge of the Barrier Falls subarea (Fig. 1.17) all exhibit considerable environmental differences from each other and during historic times served as habitat for related but separable ethnic groups.

Examination of topographic maps, physiographic maps, and aerial photographs that encompass the Barrier Falls subarea clearly reveals that the Kootenai region rests in a mountainous setting (Fig 1.18). With the exception of portions of the higher elevations along the continental divide, the Kootenai region is the most rugged of the regions in the Barrier Falls subarea. Where narrow mountain valleys characterize much of the Kootenai region, wide, relatively open valleys hemmed by mountains predominate in the remainder of the subarea. This is not to imply that the Kootenai region does not have sections of open valley, or that the remainder of the subarea is not mountainous, for the entire Barrier Falls subarea lies along the western slopes of the Rocky Mountains. It is apparent, however, that there is considerably more open terrain in regions east and south of the Kootenai region.

Three localities within the Kootenai region have either demonstrated or high potential for archaeological prominence. The three localities identified here consist of the terrain immediately adjacent to the Kootenai River, principally the floodplain and related nearby terraces. As described by Willey and Phillips (1958:18) a locality is a spatial unit

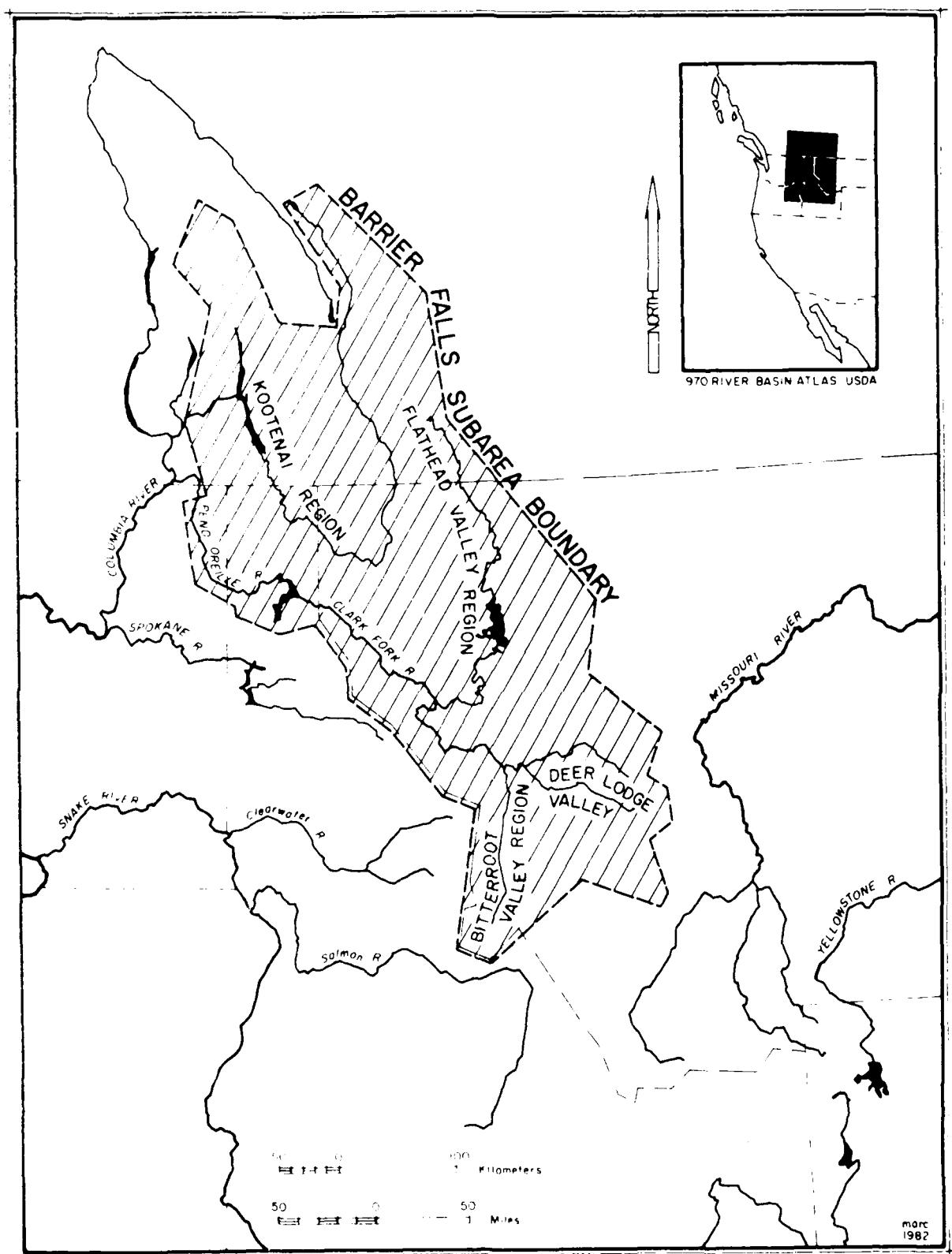


Figure 1.17. Regions of the Barrier Falls subarea.

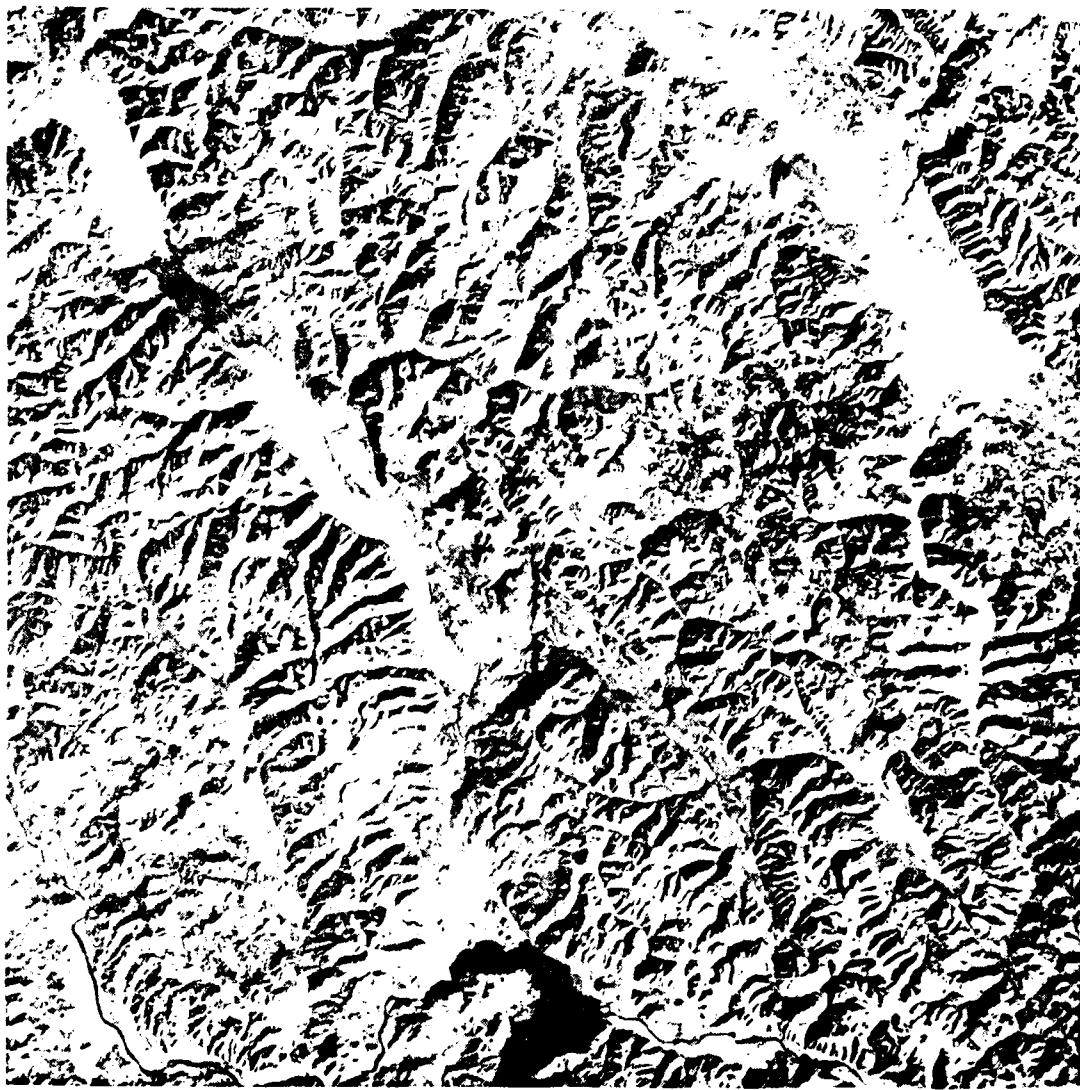


Figure 1.18. ERTS photography of Kootenai Region topography.

. . . varying in size from a single site to a district of uncertain dimensions; it is generally not larger than the space that might be occupied by a single community of a local group. It is hardly necessary to add that such limits as are implied in this qualification have the variability found in the size and settlement patterns of local groups from one sort of society to another. In strictly archaeological terms, the locality is a geographical space small enough to permit the working assumption of complete cultural homogeneity at any given time. This is not to say that two or more discrete archaeological units might not, under special conditions, simultaneously occupy the same locality, or even the same site.

The three localities are defined in terms of their settings. From Canal Flats downstream to the southern margin of the Tobacco Plains, a distance of about 190 k (R.M. 370-250), is identified as the Valley locality. This north-south trending valley ranges from about 10-30 k (6-18 mi) in width if the foothills are included as part of the valley. The Canyon locality extends from the southern edge of the Tobacco Plains to the mouth of the Moyie River, immediately east of Bonners Ferry, Idaho. This 140 k stretch of river (R.M. 250-160) consists of an extremely narrow canyon walled by steep mountain slopes. The canyon bottom rarely exceeds 3 k in width (1.5 mi) and at locations the mountain slopes converge at the river providing limited access along the river edge. From Canal Flats to the Moyie River the Kootenai has a relatively constant drop of about 0.8 m/k except at Kootenai Falls where the drop is 18 m in 3.2 k (Bonde and Bush 1975:15). From the mouth of the Moyie River to Bonnington Falls, downstream from Nelson, British Columbia, the Kootenai River is virtually flat and changes in the water level of Kootenai Lake in British Columbia affect the water level of the river at Bonners Ferry, Idaho (Bonde and Bush 1975:15). Here, the river has numerous backwaters and sloughs formed by oxbows of the wandering river. This 220 k stretch of river (R.M. 160-25) contains the Lake locality, designated because of the presence of Kootenay Lake and the low gradient of the Kootenai River.

The three designated localities (Fig 1.19), Valley, Canyon, and Lake, do not correspond to the common ethnic divisions of upper and lower Kutenai (Turney-High 1941:14), but represent archaeological localities based principally on their topographic settings. The three localities do agree roughly with proposed dialectic variation identified by linguistic studies (Morgan 1978:1) and adopted as ethnic divisions by Choquette and Holstine (1980:25 ff). The Lakes locality approximates the territory of the Lower Kutenai, the Canyon locality that of the Midriver dialect, and the Valley locality equates with part of the area inhabited by the Upper Kutenai. As archaeological inquiry progresses additional localities may prove necessary. The Kootenay source and the valleys of the Yaak and Moyie rivers are likely additions. It seems certain that most, if not all, of the Kootenai region was utilized by prehistoric inhabitants. The nature and extent of occupation outside the three defined localities will have to await additional scrutiny for a more precise statement of their significance.

This development of spatial divisions will hopefully provide a springboard for comparative purposes. Archaeologists can readily reference their statements to a particular geographic unit and presume that others will have the same semantic referent. The hierarchy of units is depicted in Table 1.1.

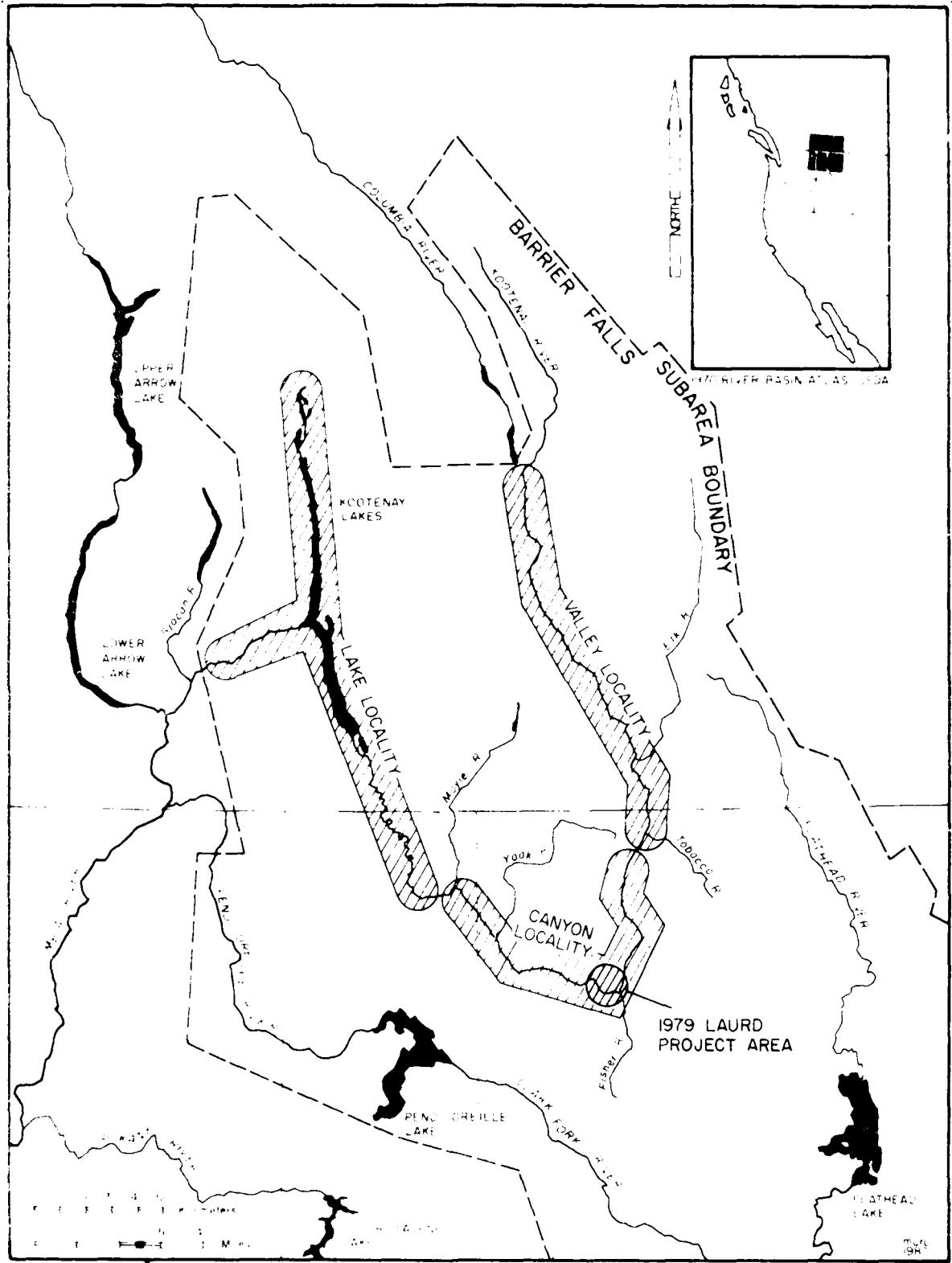


Figure 1.19. Defined Localities of the Kootenai Region.

Table 1.1. Hierarchy of Spatial Divisions in the Northern Plateau.

<u>Area</u>	Northern Plateau
<u>Subarea</u>	Okanogan Columbia Headwaters <u>Barrier Falls</u>
<u>Region</u>	Pitterroot Valley Flathead Valley Deer Lodge Valley <u>Kootenay</u>
<u>Locality</u>	Valley Lake <u>Canyon</u>
<u>Site</u>	24' 10 24 N528 24LN1020 24LN1029 24LN1124 24LN1125 Others

## ASSUMPTIONS AND MODELS

In November 1978 Roll presented a paper at the Plains Conference entitled "The Northern Rocky Mountains: Evolution of an Archaeological Framework." The paper provided a brief history of archaeological work in the U.S. portion of Lake Koocanusa, noted the pronounced increase in the number and types of sites identified with each new reconnaissance, ranging from seven sites in 1950 (Shiner 1950) to 34 sites in a 14% sample in 1976 (indicative of at least 400 sites in the reservoir)(Jermann and Aaberg 1976). Roll also attempted to explain the reasons for the paucity of sites identified in the early surveys and why so many more sites were located by the most recent investigations. The 1976 estimate of >400 sites in the reservoir area stands in marked contrast to comments that resulted from the 1950 survey:

The reservoir area was characterized by a paucity of archaeological sites. Those sites which were found showed at best only a thin or very poor midden deposit [Shiner 1950].

The paper concluded that prominent variables that biased results included historical, environmental, and project design factors.

Historical factors that influence the perception of the archaeological record are the available early historic accounts of the region, ethnographic preconditioning, the history of previous archaeological investigations, and areal bias of the observer(s) and changes in archaeologists' perception of what defines an archaeological site. Presumably, most of the archaeologists working in the northwestern United States are familiar with the more prominent of the early explorers' journals. In Montana the Lewis and Clark expedition has assumed almost legendary proportions. Residents commonly refer to the extreme hardships the expedition members suffered while in western Montana. From August 22 to September 22, 1805, while crossing the continental divide from the Salmon River into the Bitterroot Valley, over Lolo Pass and down the Clearwater River to the Snake River, the explorers suffered from constant food scarcity (Thwaites 1959II). In the immediate vicinity of the LATRD project David Thompson found scarce resources during the summer and fall of 1807 when he established "Kootenae House." On April 22, 1808, while near "Kootenay Falls," both Thompson and the Indians he encountered were on starvation rations (Tyrrell 1916:386-389). Such information does not lead one to conclude the area was inhabited by a large prehistoric population.

Ethnographically the Kutenai Indians present an enigmatic picture. From reading Turney-High (1941) one concludes that he favors a northwestern Plains origin for them even though he presents other possibilities. The Kutenai language has been variously identified as a remote branch of Algonkin-Wakashan by Sapir (Holder 1966:viii), a

language isolate, and, more recently, as remotely related to Salish (Morgan 1978). Regardless of the relationship, scholars have tended to look to the outside for Kootenai origins.

The journals of David Thompson contain scant reference to indigenous people while on the Kootenai River upstream from Kootenai Falls. This alone might have led to the conclusion that the Kootenai Region was sparsely and intermittently populated. Kroeber's (1963:138) population density estimate of 2.01/100 km<sup>2</sup> furthers the notion of low population densities. The actual implications of a population density of 2.01 persons/100 km<sup>2</sup> take on new significance when compared with a density of 16/100 km<sup>2</sup> for the !Kung San of the Kalshari Desert (Lee 1968).

The areal bias of the observer stands as an additional confounding factor. Archaeology began late in the Kootenai River Region, with the first work reported by Shiner (1950). In almost all instances the people who worked in the Kootenai had been trained in other areas. They brought with them their experience from those areas, but also their prejudices. Survey in the Kootenai Region requires observation of an entirely different set of attributes than in those areas where prehistoric cultural remains exhibit a high level of visibility. The single most reliable indicator of the presence of buried cultural materials in this region is fire-broken rock. Those unaccustomed to such low profile indicators would readily miss them in their search for brilliantly colored flint chips, masses of broken bone, or structural depressions.

Environmental conditions that persist at or preceding the survey have an additional confounding effect. All of the archaeological surveys undertaken before 1975 were faced with the extraordinarily heavy native vegetative cover of the Canyon locality. The heavy alluvial depositional and erosional regime of the Kootenai River no doubt has obscured many sites and destroyed others. To further complicate matters, historic roads, railroads, and other activities have modified the terrain. (It should be noted that while some of these activities damaged or destroyed archaeological resources, in many instances, these disturbances revealed the presence of cultural remains that would otherwise almost certainly have gone undiscovered.)

The 1976 Lake Koocanusa survey had the advantage of a precise Corps of Engineers project design that forced the reconnaissance archaeologists to examine terrain that would probably have gone unexamined in earlier days. Most of us have heard the statement "there aren't any sites up there, its too . . ." Yet upon examination sites often appear in those zones that are "too . . ." Since 1975 surveys in the Koocanusa Reservoir pool have had the advantage of slopes cleared of vegetation and in many instances substantial amounts of overburden. Archaeological sites that were once hidden under the forest duff suddenly stand out clearly. Another important consideration is that the definition of a site has changed with archaeologists recognizing the significance of even small, low visibility manifestations. Most importantly, the more recent archaeologists know that the remains of human activities are present in relative abundance.

Roll's firsthand experience in northwestern Montana is based on a childhood spent there. Since 1975 he has been involved in the archaeology of the region in various ways, as both an observer and a participant. These experiences created many impressions about what archaeology in the Kootenai should produce. Roll entered into the 1979 LAURD project with many preconceptions about Kootenai archaeology and numerous objectives to be fulfilled. He was convinced that a region as rich as the Kootenai must have supported a population far more dense than Kroeber's estimate of 2.01/100 km<sup>2</sup>. In fact, he found it difficult to believe that it did not support at least twice the density of the Kalahari Desert. In his enthusiasm Roll anticipated the discovery of pit house villages on the floodplain terraces of the Kootenai River upstream from Kootenai Falls. Surely this was an abundant land and would produce a prehistory much like that of the Columbia Plateau to the west. Slowly and with much resistance these bubbles burst. The reality of the LAURD project required that the preconceptions and assumptions be reevaluated with the data recovered in mind. Models that might account for the nature of Kootenai prehistory had to be examined, accepted, rejected, modified or created.

#### MODEL BUILDING

At the beginning of the 1979 LAURD project virtually nothing was known about the nature of the habitation and prehistoric utilization patterns within the Kootenai River valley. Several previous studies existed (Borden 1956; Choquette 1972, 1973, *et passim*; Shiner 1950; Taylor 1973; Jermann and Aaberg 1976; Roll 1979) but these were of a sketchy nature or extremely localized. Draft report segments of previous work on the LAURD U of I project were also available to us. Most of these, however, were very rough draft, openly contradictory or, in some cases, completely inaccurate.

Our initial goals were very general, and we felt it would be unwise to attempt to derive specific land use, subsistence pattern or habitation models on the information available to us. We formulated some very general models and formulated techniques which could be used to address these and which, we hoped, could be expanded and elaborated to apply to more elegant models that we would derive within our beginning framework.

Because our current models were so general and because we felt that other models we had seen applied to the area were inadequate, we decided to begin accumulating new data we could use as the basis for new, directly applicable models (cf. Kuhn 1970). In essence, we designed the excavations to generate data relative to spatial organization and location of camp types which would then allow us to formulate inductive generalizations upon which later hypotheses or models could be based. Our only choice was to then apply our hypotheses to the same body of data and, hopefully, data from subsequent excavations in the LAURD project area. We did not expect to show significant progress in this process between Phase I and Phase

(Phase I, May - August, 1979; Phase II September - November, 1979) in the formulation of our inductive generalization or in hypothesis building, and decided to treat both phases as part of the initial data collection aspect of the project.

As the project was halted, we will not have the option of testing our hypotheses and models on subsequent research in the LAURD project. Should it receive Congressional approval and become operational again, we may still be involved in future work here. We feel that it is now necessary for us to extract as much information as possible from the existing historical, historic, archaeological, ethnographic and ethnological data, and to use the data from these to derive a set of models and theories, and hopefully, some models concerning the social organization of the Kootenai River valley.

#### Applicable Models

Two recent archaeological studies have provided alternate paradigms for the organization of archaeological materials. Lewis Binford's work upon the Nunamit Uskimo (Binford 1978) provided empirical evidence for a series of propositions derived earlier by the same author (Binford 1972). Basically, these propositions state that most archaeological visible activity is conducted by special purpose groups and is spatially isolated within a site or geographic area. This model for spatial organization of activities has provided the impetus for a considerable amount of research in measuring spatial relationships among artifacts and between artifacts and other material found on a site (Wallen 1973, 1974; Clarke 1977; Hodder and Orton 1979).

The other view advocated by John Yellen (1977) holds that activity patterning is based on the overall social organization of a group rather than the assignment of specific areas to specific tasks. This model of societal organization of activities holds that work is organized within the context of group structure and organization. Work is performed when and if needed, but within the context of a group that assembles around important features within a site (hearths, latrines, storage, etc.). Such focal areas will be the locus of all activities and will take place outside of the site ("camp" in Yellen's terminology), though some which require large amounts of space or specialized equipment (hunting, etc.) may be present within a site (Yellen 1977).

Another difference is that Yellen believes his model is universally applicable, while Binford points out that there are specific circumstances under which the descriptive strategies of the groups do not apply. In particular, he notes that the types of organization they observed in the Nunamit Uskimo depended on and not always present in the Kootenay. Both models have their merits from both descriptive and theoretical perspectives.

Binford notes that the Nunamit Uskimo of North Central Alaska are primarily dependent on caribou for their subsistence. The winter diet consists of dried meat, and diet consists of caribou meat

and by-products (Binford 1978:156-159). Gathering plays a vanishingly small role in Eskimo subsistence, although enough vegetable foods are gathered during the short growing season to provide important dietary supplements. Caribou are highly migratory and pass through the area occupied by the Nunamiut in spring and fall. The Eskimo must, therefore, concentrate their game procurement during these two seasons and store enough meat to last through summer and winter. Hunting success is only predictable in spring and fall. Binford's figures indicate that there is a net dietary loss during the winter and summer, and that the Nunamiut do not recover enough meat to survive for six months out of a year (Binford 1978:Table 4.3).

During the annual migrations, animals from a single herd are killed and quickly removed from the migration path, lest their carcasses frighten the next migratory herd. Kill and preliminary butchery activities are necessarily patterned in space and take place in different locations in Binford's model. Also at this time, the number of animals killed far surpasses the time available to the hunters to process them. Thus, differential processing practices occur at quite different places. Also, the fact that meat is stored requires that other butchery activities be spatially localized. Meat destined for drying is often processed near drying racks and is treated in a unique manner. Meat to be placed in cold storage is processed near storage areas, and meat to be consumed directly is taken to the house or eaten immediately.

Binford takes great pains to point out that the decisions Eskimos make relative to what to do with a particular animal or part are highly rational decisions based on a wide variety of data input and closely approximate a least-effort model. Yellen notes that the !Kung San are equally rational in their approach to their environment, but with far different results.

The !Kung San of the Kalahari Desert in northeastern South Africa live in an area which entirely lacks large migratory game, or animals that normally form any kind of substantial herd. Vegetable foods are plentiful, despite the desertic environment, and form the bulk of San diet. Animal foods, however, are highly prized and a relatively great amount of effort is required to obtain them. Animal foods probably could not provide adequate subsistence for San groups even if such an adaptation were desirable.

The San practice what Binford calls an "encounter hunting technique;" men go out in search of game, and if they chance to encounter it, they attempt to take it. No regular, predictable movement of game takes place and vast quantities are rarely available for calling. Similarly, there is seldom an absence of game in an area, so meat is almost always potentially available. Given the relatively even distribution of game, especially during the wet season, encounter hunting will be a relatively successful technique, particularly if several individuals or groups go out on a given day.

The tropical, dry environment of the Kalahari desert effectively precludes storage of meat, since the potential for spoilage or maggot infestation is too great. Similarly, storage of vegetable foods is

In the LAURD project area, between Libby Dam and the Ripley Terrace (Fig. 2.1), the river has cut into the steeply dipping Precambrian sedimentary rocks. The Precambrian foundation is overlain by unconsolidated sediments of late Quaternary age. Glacial tills, outwash gravels, glacio-fluvio-lacustrine sediments, alluvium, alluvial fan gravels, and colluvium are nested within the river valley and adjacent low elevation mountains. In some locales these sediments are intricately mixed.

The Kootenai River is not situated in a typical "U"-shaped valley, a feature of previously glaciated terrain. Instead, the river maintains a course through a steep "V"-shaped valley. However, near Libby, Montana, the Kootenai River has cut through late Pleistocene deposits which consist of lacustrine sediments, outwash gravels, and tills clearly indicating that the area had been glaciated.

Explanations for the occurrence of steep-sided "V"-shaped valleys are that glaciers did not occupy the area, that sedimentary rocks (the consolidated Precambrian Belt Series) do not retain or yield glacially sculpted features, or that enough time has elapsed for normal erosional processes to modify glacial features. Since outwash terraces, tills, and lacustrine silts of mid- or late Pinedale age are found nearly everywhere in the study area, including much of the river valley from Libby Dam to Bonners Ferry, Idaho, the Kootenai River valley must have been occupied by valley glaciers or by remnant, stagnant continental ice (see Richmond and others 1965, and Alden 1953, for discussion of ice extent and positions of glacial Lake Kootenai during Pinedale time). Differential sculpting by ice and post-glacial erosion of the highly fractured Precambrian sedimentary rocks is probably the best explanation for the presence of "V"-shaped valleys.

Holocene flood plain sediments are found as much as ten meters above the modern river level and are cut-and-filled into late Pleistocene glacial deposits. At several places Holocene deposits rest on Precambrian bedrock.

River terraces formed during the Holocene are located above normal high water marks. However, prior to the completion of Libby Dam, all terraces had been breached, planed, and modified by high water.

#### Geologic Units

On the basis of field reconnaissance, air photo interpretation and stratigraphic descriptions, twelve mapping units were defined. Eleven of these are part of the Quaternary system. The twelfth is Precambrian bedrock (P<sub>E</sub>). Clastic sediments consist of three late Pleistocene (probably mid to late Pinedale) units and seven Holocene units. The units included in the Pleistocene are glacio-fluvio-lacustrine deposits (Of1), glacio-fluvial sand and gravel (Qsg), and landslide debris (Qsl). Holocene depositional units consist of five differentiated flood plain alluviums (Qae, Qam, Qal, Qap, and Qm), alluvial fan gravels (Oaf), and mudflow debris (Qfm). An additional mapped unit consists of time transgressive colluviums (Qc) that occur

2. HOLOCENE GEOLOGY, GEOMORPHOLOGY AND STRATIGRAPHY  
OF THE  
LAURD PROJECT AREA

by

Bruce Cochran and Frank C. Leonhardy

INTRODUCTION

Between May 1979 and October 1979 geologic studies were conducted in the LAURD project area (Fig. 2.1) to provide archeologists with information concerning the gradational history of the Kootenai River. The objectives of this study were (1) to describe the physical stratigraphy of archaeological sites excavated by Montana State University archaeologists in 1979; (2) to identify and correlate late Quaternary deposits within the project area; (3) to establish a relative geochronology and place the sites within that chronology; (4) to interpret site sediments with respect to depositional environments; and (5) to provide a map of late Quaternary stratigraphy.

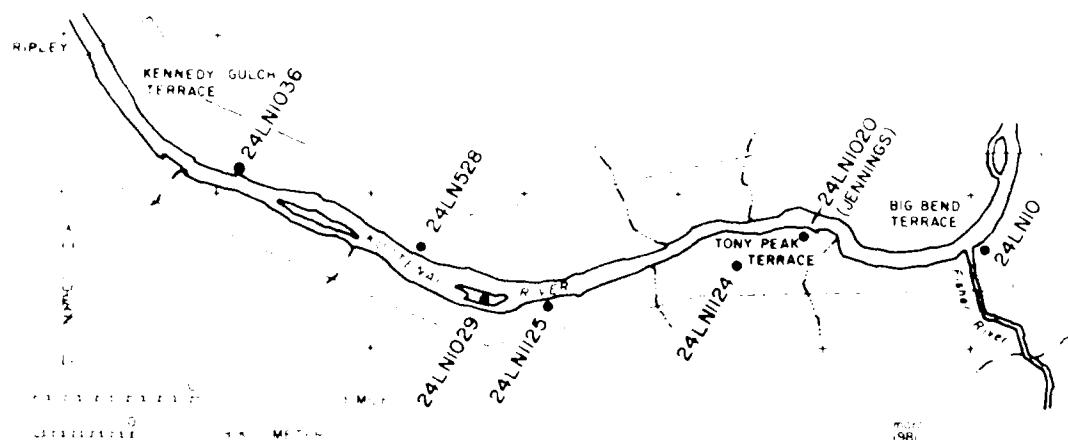


Figure 2.1. Important landmarks in the LAURD project area.

Geologic Setting

The Kootenai River flows southward, parallel to the Purcell Mountains of southeastern British Columbia and northwestern Montana. At the confluence with the Fisher River (Fig. 2.1), the Kootenai swings abruptly westward through the Purcell Mountains. At Bonners Ferry, Idaho, the river turns northward, entering Canada at Ryherts, British Columbia.

Hunting and gathering is the most basic level of human subsistence adaptation. At this level of inquiry environmental factors play a prominent role in either collector or forager subsistence-settlement systems. This is not intended to argue that the environment determines the subsistence-settlement system, for human cultures constantly modify their environments to their desires within the limits of their technology. At the hunting-gathering level we should anticipate that human cultures are closely articulated with their environment. The tools, features, facilities, and sites they leave behind provide the keys to the extent to which they are manipulating their environment.

In order to understand how the cultures were adapted to their environment we must have an understanding of the environment at the time or times of occupation. Contemporary archaeologists have come to rely on specialized environmental studies, including geology, geoarchaeology, paleoecology, and others in an effort to understand past environments. The following chapters summarize the results of geological, geochronological and soils studies, and palynological studies undertaken by subcontractors as part of the LAURD Cultural Resources Project. These studies provide base line data on past environments and on erosional-depositional conditions that affected prehistoric people and the preservation of the land surfaces they occupied. Additional chapters present an approximation of the prehistoric subsistence-settlement system and a provisional culture-historical outline of the Canyon locality of the Kootenai River Region.

productive by previous testing we reexcavated test pits to check stratigraphy and began opening adjacent units. If artifacts and feature materials were discovered the excavations were expanded horizontally to exhaust the concentration. Extensive excavation blocks allowed us to expose large single features and feature complexes in their entirety and to remove each vertical level simultaneously.

By the end of project field work on November 9, 1979 the 1979 LAURD Cultural Resources Project had performed salvage excavations at five sites and extensive tests at one. The effort resulted in hand excavation of a total area of 1145.8 m<sup>2</sup> with the total volume of sediments removed calculated at 556.9 m<sup>3</sup>. Backhoe tests at the five excavated sites removed another 985.1 m<sup>2</sup> and a volume of 1232.6 m<sup>3</sup>. The excavated area and volume for the individual sites is presented in Table 1.2. These excavations produced 1861 formed stone and bone implements, about 155,300 unidentifiable (to species) bone fragments, nearly 5,000 identifiable bones and more than 300,000 fragments of fire-broken rock. Detailed descriptions of these sites and the data recovered from them may be found in the "Descriptive Archaeology of the 1979 LAURD Project" (Roll and Smith 1982).

Table 1.2. Area and volume excavated during 1979 by site.

Site	Hand Excavation		Backhoe Tests	
	Area (m <sup>2</sup> )	Volume (m <sup>3</sup> )	Area (m <sup>2</sup> )	Volume (m <sup>3</sup> )
24LN10	41.0	21.8		
24LN528	278.0	154.8	249.0	174.3
24LN1020	178.3	72.9	610.5	915.6
24LN1029	41.0	48.9	6.0	10.5
24LN1124	119.0	50.7	39.0	39.0
24LN1125	<u>488.5</u>	<u>207.8</u>	<u>80.6</u>	<u>93.1</u>
Total	1145.8	556.9	985.1	1232.5

#### EMPHASIS OF THE STUDY

This study has emphasized inquiry into prehistoric cultures of hunting/gathering populations. Binford has recently (1980) distinguished two varieties of hunting and gathering adaptations on the basis of their subsistence-settlement system. Foragers acquire necessary or desired resources by a series of "... residential moves and adjustments in group size . . .," while ". . . logically organized collectors supply themselves with specific resources through centrally organized task groups [Binford 1980:10]." In the broader context of Binford's discussion and in light of the environmental context of the Kootenai Region, it seems most reasonable to identify the prehistoric hunting/gathering cultures with which we are dealing as foragers.

Our investigations were predicated on the belief that structure and organization rather than formal content define cultural systems. The excavation strategy chosen was developed around those beliefs and assumptions. We excavated contiguous blocks around known or discovered artifact or feature concentrations in an attempt to maximize the recovery of spatial distribution patterns. In so doing, we made no assumptions that our excavations would or even might recover material representative of the entire site. Unexcavated areas remain unknown.

#### THE FIELD EFFORT

Mobilization of the 1979 LAURD Cultural Resources Project was begun on May 14, 1979 and excavations commenced May 21, 1979. Work continued uninterrupted until August 3, 1979 when the contract for field work ended. The contract was renegotiated to include additional sites and excavation began again on September 10, 1979 and continued until November 9. Field quarters were abandoned November 16, 1979 and the remaining personnel removed to Montana State University to continue analysis and begin writing the final reports. The field effort involved an archaeological team that averaged about 42 people (28 field, 9 laboratory, 3 administrative, and 2 support). In addition to the basic archaeological team subcontracts to conduct palynological and geomorphological work occasionally increased the total personnel present in the project area to more than 60.

At the beginning of the project we received a minimum of information about the sites to be excavated from both the Corps and the 1977-78 survey and testing contractors. Available information consisted of Corps-supplied management summaries and partial field records, personal communications, and incomplete reports from the U of I since the final survey and testing reports were not completed. Due to internal inconsistencies in the data received, and lack of correlation between this data and that recovered in our initial excavation units, we adopted the following field strategy.

The initial objectives of the fieldwork were to define site boundaries, identify concentrations of cultural material within those boundaries, and examine the relationships among the contents of those concentrations. Because of the inconsistent information available as mentioned above, we found it necessary to repeat some of the steps of the survey and testing phase in order to utilize more efficiently excavator time, as well as to fulfill the stipulations of the Corps contract.

Using the available data we superimposed a coordinate grid system on the sites that correlated with the U of I system. With horizontal and vertical controls established, site boundaries were defined by excavating a series of parallel backhoe trenches (usually at 1 m intervals) perpendicular to the river. Where vegetation precluded the use of the backhoe 25 cm<sup>2</sup> shovel tests or a small orchard auger were used, usually in 10 m intervals. In areas of sites indicated

Carefully formulated research designs and sampling designs concurrent with the state of archaeology dictate site excavation strategies. Obviously, they must apply to the archaeological manifestation under investigation. The current and continuing controversy in American archaeology over what constitutes a site and how to define sites has a direct bearing on sampling design as well. This problem assumes particular validity when dealing with small sample sizes and sites scheduled for destruction.

The more precisely we define sites or related concentrations, the better we may assess the applicability of various sample strategies. Adequate definition and elimination of false assumptions about the nature of the universe we intend to sample permit greater precision in the choice of sampling strategy. Truly accurate background information on the extent and nature of a site is the best basis for selection of a specific sampling strategy.

Once the site or concentration has been defined, two separate goals may direct the sampling decision. The first would elect to obtain a "representative" sample of both the artifacts and the features contained within the site. The second decision would focus on the investigation of structural organization of space by the prehistoric inhabitants of the site. Justification exists for either strategy and each has its proponents.

These two strategies commonly appear as mutually exclusive goals. Archaeologists commonly base site content investigation on some variant of probability based sampling theory, which attempts to achieve a "spread" of excavation units over the site area. Context analysis requires excavation of large blocks of units to open a large, contiguous area. Total site excavation represents the only truly happy melding of these disparate approaches. Since restrictions of time and funding usually prohibit total excavation, the archaeologist must make some decision prior to and during excavation. The archaeologist may elect to examine either content or context.

The decision making process takes on particular importance when excavation may include only minute proportions of the total site area involved. For example, a 0.3% sample of a site 50,000 m<sup>2</sup> consists of only 160 m<sup>2</sup> (40 2x2 m units). Placed contiguously this could represent an area of 10x16 m, less than the area recorded for the smallest contemporary band level hunter-gatherer camps. Obviously, the site could contain more than 200 separate camps, none in stratigraphic superposition, and none of which would receive even minimal investigation using a content oriented sampling design.

However, utilizing a context oriented sampling design would permit intensive study of the socio-cultural organization of space within one such camp. Potentially, the context oriented approach could provide more significant and "representative" data relevant to site structure than anything resulting from a probability-based sampling strategy. In fact, small sampling frequencies of large site areas virtually guarantee that we will learn nothing of importance about structural and organizational parameters of the cultural systems involved.

area, but it seems unlikely that significant group movement would take place into the northern Rocky Mountains during the middle of winter. The cost of attempting to exploit the LAURD project area during the fall and/or winter by an outside group, we concluded, would be far too great to have occurred on a regular basis. An outside group might, however, find reason to exploit the area's resources during late spring-early summer if their own resources failed to fulfill their anticipated needs at that season.

The above represent a series of very generalized models for prehistoric utilization of the Kootenai River valley. For the most part, they were drawn from past research in the area (e.g., Choquette 1975, et passim.), from ethnoarchaeology (Yeilen 1977), modern ethnography (Binford 1978), historical accounts and some generalized ideas about the possibilities available along the Kootenai. Because of the way they were constructed, they are exceedingly general. We deliberately avoided using too much of our own data in the building of these models, but will attempt to apply them to the material we recovered.

#### COALS AND APPROACH

The primary culture historical and scientific goals of the 1979 LAURD project were predicated upon the state of current knowledge of the prehistory of the Kootenai River Region, specifically the Canyon locality, which lies between Pinkham Creek and the mouth of the Moyie River. The prehistory of this area was largely unknown and most investigations have been associated with the Libby Dam cultural resource management efforts sponsored by the Corps of Engineers. Since these efforts were viewed as pioneering, basic descriptive data concerning the cultural sequence and the artifact record needed to be developed. The general research goals of the project were as follows: 1) to examine the adaptation of prehistoric societies to the environmental situation represented in the archaeological record, and 2) to provide a comparative base for examination of adaptive strategies in the Canyon locality in contrast to those known or being developed for surrounding areas. This involves the determination of the types of sites represented within the project area and the delineation of activity areas within single site components. Given the unknown character of regional prehistory, our procedures were designed to concentrate on the development of artifact and feature typologies and to reconstruct those parts of the environment that were being exploited by the prehistoric inhabitants of the area and to determine the manner in which they were being used.

The immediate project goal was to mitigate the effects on the specified archaeological sites of ground disturbing activities associated with the Corps' LAURD construction project. This was to be accomplished by scientific removal from stratigraphic context and interpretation of as much culturally relevant material from the designated site areas as possible within the limitations of contractual obligations. These objectives were to be achieved in a manner consistent with modern scientific archaeological goals.

occupations and a rather confused spatial pattern of artifacts and other remains. Most sites would probably not exhibit discrete occupations, but rather a jumble of unrelated occupations one on top of the other.

It must be remembered that potential site areas are not plentiful within the project area. The Kootenai valley is a narrow, steep V-shaped valley with a small floodplain and a few small terraces. Below the LAURD damsite, the valley opens out, and upstream broader, habitable areas are available on the Tobacco Plains. Within our area, however, the few decent site locales might have to be utilized repeatedly for several different purposes.

One final model of seasonal exploitation of the Kootenai River area may be forwarded. It is possible that the Kootenai valley was, in fact, not inhabited permanently or even regularly by groups who claimed it as their territory, but rather that this portion of the Rocky Mountains was a marginal area that was utilized only sporadically by groups from the Plateau, Plains and Basin. In fact, the traditional Plains-Plateau-Basin geographic division implies such a reconstruction.

This interpretation suggests that the northern Rockies were not inhabited during most of the year, and perhaps not during most years. Rather, it was considered as a reserve of potential foods which would only be tapped as needed. As long as food resources were plentiful within the traditional areas, groups would remain there. When major resources failed in one area or another, people would begin to move into the mountains to exploit what they had to offer.

Under such a model, we would expect fairly sparse, well separated scatters of tools on most sites. We suggest that this situation would lead to rather long term habitation of the area (+ 2 months) and, further, that the sites would be occupied during late spring-early summer. Even bad years should provide sufficient precipitation that essential resources would be present to support groups throughout the spring and summer. Later in the year, as resources were depleted, these areas would be abandoned.

Also, if our project area was a temporary haven for groups from surrounding areas, we should expect to find excellent examples of most (or at least many) of the classic tool types from each home area. Typologies within any one scatter should uniformly represent a specific Plateau, Plains or Basin assemblage, and stylistic forms not found in the homelands would not occur in our collections. If the deposition rates at our sites were low, some mixture of occupations would be possible. Given the sporadic nature of habitation in the area, however, that should be uncommon.

We briefly considered the possibility that Plains, Basin and/or Plateau groups would move into the mountains seasonally to exploit locally abundant resources. However, food abundance in the project area would closely correspond to the times food was abundant elsewhere so that exceptions of localized resource failure. The winter deer migrations along the Lister River might tempt people into the

core area which included the project area and nearby portions of the Kootenai valley, in addition to the valleys and mountains on either side of the river.

Group movements for specialized pursuits (e.g., fowling, salmon fishing, bison hunting) did not involve entire bands. Rather smaller familial or special purpose groups would branch off to take advantage of resource availability. At any one time, members of the Libby-Jennings band might be in the Pend Orielle area or Kootenay Lake and/or within the project area. The winter bison hunts involved only men and women in their prime years. Older men and women, children and mothers with babies were left in the Kootenai region in winter camps, along with a few adult men for protection (c.f. Schaeffer 1940). Other movements would involve splitting the group differentially, and there would almost always be people in the core area at any time of year.

This type of adaptation, of course, allows humans to maximize use of differentially available resources. If the salmon runs on the lower Kootenay River in Canada are particularly plentiful, group members could return to bring more people to exploit them. Should the migration fail, other resources are being tested and exploited, and the group is not committed to a single potentially dangerous course of action. The Kutenai, then, were following a flexible maximization strategy wherein the range of resources was continually being explored and those which proved to be especially productive could be exploited immediately and effectively.

The Kutenai inhabited an area where any one resource could and did fail. Deer populations normally experience considerable fluctuations in numbers and density; waterfowl will occasionally abandon part of an established flyway; anadromous fish runs can fail; vegetables and fruits can be killed by an early frost or late winter; and the native fish populations can vary erratically. No single resource in the area is wholly dependable, and failure must be planned for and compensated for. The central based wandering model we have extracted from the ethnohistoric descriptions seems best adapted for this area.

Given a central based wandering model, we can suggest two different settlement patterns for our project area. One assumes that central campsites existed within the area, the other that they were located near but not in the project area. Under either model, we would expect to find sites that were inhabited by fairly small, special purpose groups at any time of the year. In the first instance we would also expect to find larger semi-permanent campsites; in the latter we would not expect them in our study area, but would expect them to be nearby (e.g., in the Tobacco Plains).

Other sites within our area would be utilized for specific purposes, and would be located to take advantage of the resources being exploited. A given site might be occupied at various times during the year, if multiple resources were available near it. Most occupations would be brief and focused on specific goals. We would expect to find a considerable amount of overlap of differing

claims to have found. We examine what we consider to be the serious shortcomings within the model Choquette proposes below. For now, however, we will consider what such a model means in terms of site utilization within the Kootenai.

Choquette draws heavily on ethnohistoric accounts of Kutenai Indian subsistence (Turney-High 1941; Schaeffer 1940) for his models and suggests that a similar subsistence round might characterize the prehistoric inhabitants as well. The Libby-Jennings band of the Kutenai had a seasonal round that apparently included fowling near Pend Orielle Lake in spring and fall, salmon fishing in the Kootenay Lakes region in the fall, bison hunting on the western Plains of Montana and Alberta in fall and winter, deer hunting, trout fishing and generalized gathering within the Kootenai River area at other times.

Choquette posits an adaptive and social system of small, fairly independent bands moving as individual units between two various seasonally available resources. In the course of their wanderings, groups would also visit specific quarry areas for cherty raw materials, and the presence of these supposedly source-specific cherts should allow archaeologists to trace the movement of the various groups.

We would not expect to find evidence of any activities carried out away from the valley to be visible here. Any resources brought into the area from elsewhere would probably be in the form of dried or completely stripped meat. It would certainly not be efficient to bring unusable bone several hundred miles to these sites. We would further expect to find little or no evidence of fall habitation, since this is a prime time for resources to be available in other regions.

Sites within the project area would show a definite subsistence emphasis upon deer and trout. We would expect to find winter habitation sites and some hunting-gathering sites as well. Presumably, there would be a definite dichotomy in site placement. Areas particularly favorable for summer resources might not be suitable for winter habitation. Similarly, the factors that would make a winter site desirable (e.g., good exposure to maximum sunlight) would make its selection for summer use unlikely.

Given a restricted wandering model, we would also expect to find little difference in group size between sites. If we can determine what portions of a site reflect contemporaneous occupation, we should find each area to be of about equal size and to have a roughly similar structure. Finally, we would expect a considerable amount of intersite homogeneity, with possibly only two clusters of artifact assemblages, since the habitations and adaptations would be virtually identical from year to year.

Choquette's conclusion that the Kutenai practiced a restricted wandering pattern is, we feel, an erroneous interpretation of the published data. Our reading of the ethnographic and ethnohistoric descriptions suggests a central based wandering (Beardsley, et al. 1966) adaptation. The Libby-Jennings band of the Kutenai utilized a

processing. This would minimize the amount of time a hunter would spend away from camp and allow most of the processing to be done in relative comfort.

Assuming, as we have been, that the project area was inhabited on a year-round basis, we might also devise site locational hypotheses based on differential access to game, other resources, sunshine and the like. Indeed, it would seem reasonable to suggest that resource availability would be a prime determinant in selecting a specific location for habitation. Unfortunately, resource availability, as we use it here, is a very nebulous concept, and many of the potentially important resources are probably archaeologically invisible.

We could, however, suggest that winter sites might be located on south-facing slopes which would maximize the amount of sunlight they would receive during the day. We would also suggest that winter sites should be convenient to the Fisher River valley and its abundant concentration of deer. Late summer and early fall sites might be found on open floodplain terraces where access to fruits and other vegetable foods would be greatest. Finally, sites that are not on the river might be found near seasonal or perennial water sources.

Using these suggestions, we would assign 24LN1125 and 24LN1029 to spring and summer habitation and 24LN528 to winter habitation. 24LN1124 is a limited activity site, and could have been used at any time of year. We would not favor a winter habitation, but only because access to and movement around the site would be more difficult then. 24LN1020 and 24LN10 might be inhabited on a year-round basis. They are shaded much of the day, especially in fall and winter, but provide the best access to the Fisher River valley.

We have no a priori reason for assuming that the project area was inhabited during all times of the year. Furthermore, even if we find good evidence for habitation during each season, we have no grounds for assuming that the same social group was responsible for each site or even each feature we investigate. We must, therefore, consider the possibility that the area was inhabited only seasonally by groups whose territory extended far beyond the boundaries of our project area and possibly even beyond the Kootenai River drainage.

#### Alternative Models

We can conceive of three different reasonable models that include seasonal utilization of the project area as part of a normal subsistence cycle. Two of these are based on models initially derived by Beardsley and others (1956), and focus around their concepts of "restricted wandering" and "central-based wandering." The third suggests that this part of the Kootenai valley was a marginal or, perhaps, special use area for groups that did not forward territorial claims upon it.

Wayne Choquette (1975; 1978; 1980a) has suggested that a restricted wandering pattern of utilization for the Kootenai River area might best explain the patterns in raw material distribution he

(1977). At this time in the Kalahari, animal and plant resources are maximally dispersed. Sites are located to take advantage of ephemeral resources and people moved frequently. Along the Kootenai River, however, plant resources would tend to be scarce and thinly distributed, while game was dispersed. Groups would quickly exhaust the available plant resources in the vicinity of a camp and hunting success would decrease after short-term habitation of an area. Sites inhabited during this period of time, therefore, might be expected to be of short duration and, perhaps, archaeologically invisible. Yellen suggests that high intersite variability in tool assemblage reflects the likelihood that the same activities would rarely be carried out at any two sites. This would need to be investigated for these sites.

Along the Kootenai River late summer and early fall would produce situations that are not found among either the Nunamiat or the !Kung San. As late summer and early fall approach, berries become their most abundant. At this time, groups might be expected to localize themselves for longer periods to take advantage of differentially distributed plant sources. Berries would be intensively collected and processed for both immediate consumption and storage as winter food supplements. Game would be maximally dispersed and probably hunted from temporary bases away from camp sites. Given the relatively warm summer and fall temperatures, meat would have to be processed immediately for storage (drying). As the distance from camp to kill site increases, the probability that the animal will be intensively processed at the camp decreases. Meat and hide processing would occur near the kill site, perhaps at a temporary hunting camp. Hunting, butchering and scraping tools would all be present, although as thin scatters.

The main camps would contain some hunting, butchering, scraping tools, since some game would continue to be taken near the site and processed in it, but tools necessary for other tasks would be more prevalent. To the extent material was being processed for storage, some localization of activities would occur. Foodstuffs destined for immediate consumption, regardless of their origin, would be processed in social gathering areas and most "maintenance" activities would occur there as well.

During winter, game would be fairly concentrated along the southfacing slopes and in the Fisher River valley. Modern estimates indicate that the density of deer in the Fisher valley regularly reach 50 individuals/km<sup>2</sup> during the winter. Given that density, individual encounter hunting of deer could be attempted with virtually a 100 percent probability of success. Winter camps would be located to provide easy access to the Fisher and to the south-facing slopes of the Kootenai valley. Except for right along the river, mobility would be low and we would assume that reasonably weatherproof structures would have been constructed for winter occupation.

Winter food consumption would consist of animals taken where they congregate and of stored foods. Given decreased mobility away from the river and the extremely high probability of a successful hunt, we would expect game to be taken in individual forays. Game killed under these circumstances would probably be returned to camp for full

Jennings terrace. We could, then, use this site as a test to determine if the prehistoric inhabitants of the valley attempted to intercept deer as they crossed the river. Thus, we will examine the remains at 24LN1020 to see if it corresponds to Binford's description of a Nunamiat kill and spring kill/preliminary processing site. (It should be noted before we proceed that deer are perfectly capable of crossing the Kootenai River at any chosen point except for major falls or possibly during maximum flood conditions. The question to be asked is whether they preferred one place over another with sufficient regularity to produce a patterned cultural response.)

Binford's descriptions of Nunamiat kill sites, unfortunately, concentrate on body part occurrences and bone distributions. Virtually all of the bone we recovered was fragmentary, which precludes copying his analysis. Instead, we must abstract from the activities he discusses a probable set of tools that would be utilized and discarded at the site.

If 24LN1020 was, in fact, an area of major deer movements across the Kootenai River in spring and fall, and if it was being used as an intercept and kill site, we would expect the following: 1) The site area would be used, but not inhabited, during the spring and fall. Nearby sites (e.g., 24LN1125, 24LN10) might be the locus of habitation during these times, and the meat introduced to them might be expected to consist of animals killed and initially processed at the Jennings terrace. 2) Evidence of habitation at 24LN1020 should be restricted to winter or summer. 3) Tool kits and/or relative tool percentages found at the site would differ significantly from those found at other sites, since the site would be primarily utilized as a kill/processing area. Projectile points, knives and other preliminary processing tools (e.g. retouched pieces) should be more abundant at 24LN1020 than other sites. Similarly, if the model holds, hide processing tools (scrapers) should be relatively scarce at this site, but more common at other sites. While the percentage occurrence of these specific tools is not identical to those from other sites the differences are not sufficient to support the hypothesis and we were forced to conclude that it was probably an occupation site less intensively and less frequently occupied than either 24LN10 or 24LN1125. If we consider the nature of habitation in the floodplain of the Kootenai River it is doubtful that we will find many task specific sites. The relatively infrequent suitable terraces for occupancy would almost ensure that any of them would contain a range of camp and general living associated debris and therefore preclude differentiation of task specific loci unless there were an overpowering reason to reserve those places for single purpose use. Resolution of these problems will require the acquisition of far more clear cut and substantially more evidence than our excavations produced.

#### Other Hypotheses

If game was concentrated during the winter on south-facing slopes and "migrated" across the river to other areas after the snow melted, it would seem that the late spring - early summer camps might more closely approximate !Kung San wet season camps described by Yellen

not truly practical, since these foods are relatively abundant, even during the dry season. The rational choice for these people is to collect foodstuffs when and as needed, and to consume what is collected directly.

Among the Kung San, certain specialized activities do take place in restricted locales. However, as Yellen notes, these activities are archaeologically invisible. The majority of all activities occurs around a hearth or shade tree, and virtually all remains are concentrated around these areas. No spatially distinct groupings are visible because no specific areas were set aside for certain activities. Rather, the social network determines where activities will be performed, and virtually all activities occur at a social gathering place. Binford (1978:87-89) describes a similar pattern for the Alywara aborigines in Australia.

#### Models for the Kootenai Region

If we assume that the Kootenai valley was inhabited on a year-round basis, aspects of both Yellen's and Binford's models can be applied to it. Lee (1968) estimates that hunter-gather groups in these latitudes depend upon plant foods for between 20-30 percent of their diet. He uses a specific estimate of 30 percent for the Flathead Lake area. We would suggest that this figure is high for the Kootenai Canyon locality since the study area occupies a narrow, steep valley with few open areas. The plant cover is predominantly dense coniferous forest, and the areas suitable for leafy vegetables, fruits, and other plant foods are limited. We suspect, therefore, that plant resource availability was low during prehistoric times.

The faunal evidence from all archaeological sites in the LAURD project area indicates that the dominant game animal was deer (Odocoileus sp.), which accounts for over 90 percent of all identifiable bones found at our sites. Deer, of course, are non-migratory, and are rarely found in large herds. It is evident, therefore, that the specific ecological constraints which would tend to favor either Binford's or Yellen's model are not present in the Kootenai valley.

While they are not migratory, however, the deer populations within and near the project area do tend to have predictable seasonal movement patterns. Most deer appear to winter on south facing slopes and in the valley of the Fisher River, where snow build-up appears to be less and where thawing occurs earlier in the spring. Animals move into these areas in the late fall or early winter and return to the northern slopes in spring.

#### Test of an Hypothesis

This seasonal pattern involves considerable movement of deer across the Kootenai River, and there are only a few natural fords within the valley where they might cross. One such place is at the Jennings terrace. We examined one prehistoric site (24LN1600) on the

initially in the late Pleistocene and continue as a sedimentary unit into modern times. A relative chronology of the mapping units was established (with the exception of the time-transgressive colluviums) on the basis of stratigraphic superposition. Volcanic ash beds, modern and ancient soils, and direct tracing provided bases for lateral correlations of Holocene units. Absolute chronology for some units was established by radiocarbon dating.

#### LATE QUATERNARY GEOMORPHOLOGY

Several distinctive landforms occupy the Kootenai River valley between Libby Dam and the re-regulating dam site at Ripley. Geomorphic features pertinent to this study include complex glacio-fluvio-lacustrine terraces, "normal" river terraces and alluvial fans (Fig. 2.2). Other features, such as glacial moraines, landslides, mudflows, and colluvial slopes (talus), have little archaeological significance except that processes responsible for them may have restricted human activities.

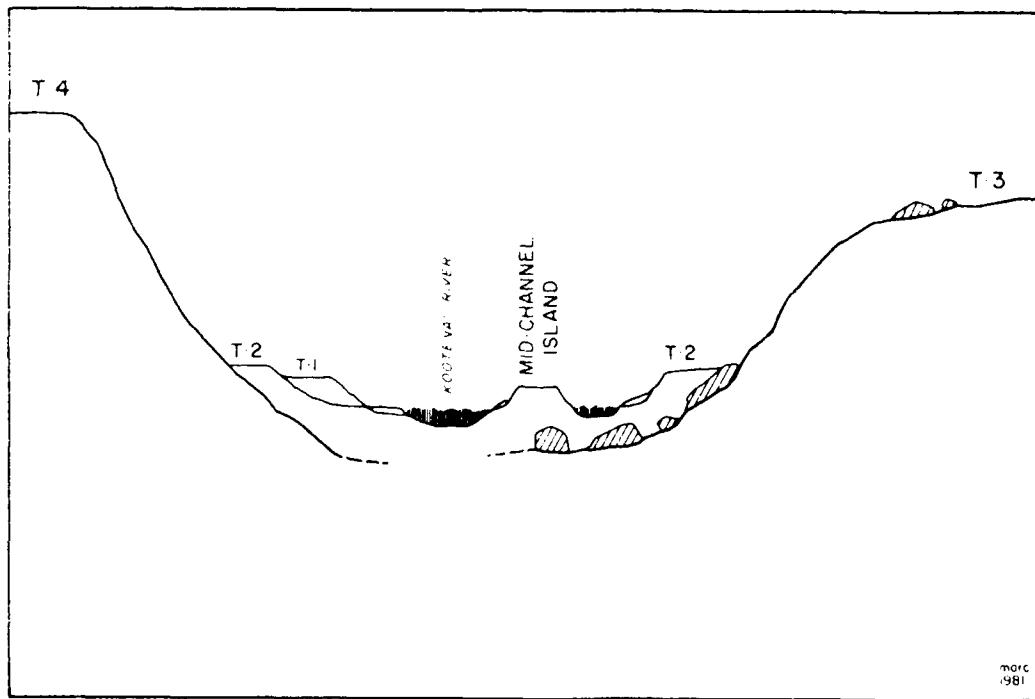


Figure 2.2. Relationship of terraces and mid-channel islands in the LAURD project area.

#### Glacial Terraces (Fluvio-Lacustrine)

Glacio-fluvio-lacustrine terraces occur at Kennedy Gulch, Big Bend, and near Tony Peak, adjacent to the old Jennings townsite (Fig. 2.1 for locations). These terraces (T4 and T3) represent separate late Pleistocene glacio-fluvial episodes in the Kootenai valley. They are recognized by differences in surface elevation and morphology and sedimentary fabric and composition (Fig. 2.2).

The Kennedy Gulch Terrace (T4) has a downstream slope of less than one degree and a streamward slope that varies between one and two degrees (Fig. 2.2). The majority of the terrace's surface lies at elevations between 2230 and 2250 ft (680 and 686 m). Backhoe cuts into the terrace reveal a complex sedimentary record. Coarse alluvial gravels are interbedded with finely laminated horizontally bedded silts and clays. At Kennedy Gulch and several other small tributaries the otherwise horizontal surface has been modified by alluvial fan gravels deposited during the Holocene.

Absolute age of formation of the Kennedy Gulch Terrace is undetermined. Its construction, however, is related to glacio-fluvio-lacustrine depositional processes that are, in turn, related to mid- or late Pinedale glaciation (ca. 18,000 to 13,000 years ago).

At Big Bend the T4 terrace lies between 681 and 692 m (2235 and 2270 ft) and has a downstream slope of less than two degrees. The terrace is composed of coarse gravels and interbeds of finely laminated silts and sands, a sequence similar to that at Kennedy Gulch. Locally, the surface has been modified by deposition of poorly sorted, rounded to angular bouldery gravels and by post-glacial erosional processes. The origin of these gravels is not clear. They could represent mass wasting, gravity flows, or gravels dropped from melting icebergs.

The Tony Peak Terrace (T3) is found between elevations of 658 - 681 m (2240 - 2160 ft). The surface slopes streamward at five to nine degrees. The terrace is composed of moderately well-sorted, well-rounded gravels and interbeds of coarse, stratified sands.

Unlike the Kennedy Gulch Terrace (T4) which is 37 - 40 m (120 - 130 ft) above the river level, the Tony Peak Terrace is situated 24 - 37 m (80 - 120 ft) above the river. It has greater surface modification on its downstream end and a greater streamward slope. The portion of the terrace that lies above 680 m (2230 ft) may be correlative to Terrace 4. However, most of the terrace has been modified by post-glacial fluvial processes which represent active downcutting immediately following ice recession and/or draining of ice-margin lakes.

#### Landslides

Huge blocks of rock (4x8x15 m) from the Striped Peak Formation (Precambrian age) rest on the Tony Peak Terrace (T3) and underlie flood plain sediments of the Jennings Terrace. The slide covers approximately one-half of the Tony Peak Terrace and is situated adjacent to the Rainy Creek syncline axis near Tony Peak (see geologic map). The landslide postdates construction of Tony Peak Terrace but predates the inception of the Jennings Terrace (T2).

## River Terraces

Two distinctive Holocene river terraces are found in the LAURD project area. These terraces are a product of both depositional and erosional processes. Repeated planation by high floodwaters prior to the completion of Libby Dam has modified the surface of both the high (T2) and low (T1) terraces. Early and middle Holocene terraces usually have a thin veneer of young deposits--fluvial and aeolian(?)--capping them.

The high terrace (T2) is found at 24LN1020 (Jennings), 24LN1036 (the Haul Bridge site), 24LN1046, 24LN1125, and at Ripley (see Fig. 2.1 for locations, and Fig. 2.2 for geomorphic position).

Terrace 2 lies about 5 - 7 m (16 - 23 ft) above the lowest water level during the summer. While structural considerations might control variability in terrace height, it appears more likely that it results from planation during high flood water overflow. Ripley best illustrates the effects of planation as sediments containing historic artifacts have filled overflow channels cut into older alluvium.

Fill in the T2 terrace consists of an upward fining sequence of sediments. Alternating beds of medium sands and silts overlie well-sorted, well-rounded, basal gravels. The T2 terrace sediments usually contain interbedded Mazama ash. Alluvial fan gravels from tributary streams usually interbed with and overlie T2 terrace sediments.

The low terrace (T1) varies between 3 - 4 m (10 and 13 ft) above the river and is composed of basal gravel overlain by alternating beds of sands and silts. Rip-up clasts of Mazama ash are found in these terrace sediments.

Within the mapped area T1 occurs most frequently as an erosional feature cut into earlier sediments. More rarely, it appears as a narrow constructional terrace inset into the T2 terrace. At 24LN1125 erosion produced T1 (Fig 2.3a), but at 24LN1020 (Jennings) a depositional regime clearly inset T1 into T2 (Fig. 2.3b). Planation of the surface of T1 has also taken place and in instances where T1 and T2 occur together (as at 24LN1020 and 24LN1125), planation has made surficial and morphological separation difficult. At 24LN1020 the downstream ends of both terraces have clearly been planed. At 24LN1125, subtle changes in relief (less than 50 cm), cut-and-fill sedimentary sequences, and lagged granule gravels in the upper part of the depositional sequence indicate overflow and possibly planation of the terrace surfaces during high water.

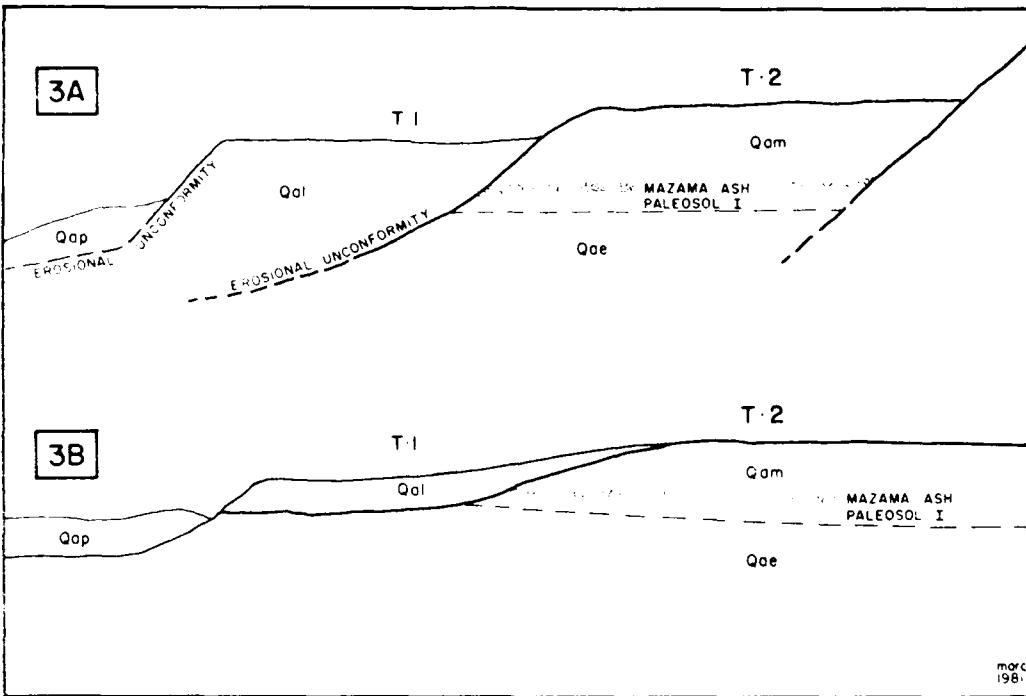


Figure 2.3. Attributes of terrace formation at 24LN1125 (a) and 24LN1020 (b).

#### Alluvial Fans

Alluvial fans occur at nearly every tributary mouth. They are cone-shaped deposits composed of very angular, poorly-sorted siltites, shales, argillites, and well-rounded glacial gravels. The fan gravels overlie the Kennedy Gulch and Tony Peak terraces (T4 and T3) and are interbedded with and overlie the high and low alluvial terraces (T2 and T1). The fan gravels probably began accumulating shortly after deglaciation.

#### Islands or Mid-Channel Bars

Several islands or mid-channel bars in the LAURD project area are probably related in part to the formation of the low terrace. They are separated from the mainland by channels which contain water only during high water. The islands are composed of well-sorted coarse gravels (probably reworked older Holocene gravels of the high terrace core) overlain by alternating beds of sands and silts. Sedimentary structures reveal that the bar at site 24LN1029 has been disconnected from the mainland since the inception of the island.

#### Mudflow Features

At site 24LN1125, Area C, a hummocky feature rests on the lower terrace. This feature is lobate, displays undulating relief, and is composed of poorly-sorted, non-stratified gravelly silts and sands resulting from a mudflow.

## LATE QUATERNARY STRATIGRAPHY

Criteria used to distinguish and correlate late Quaternary depositional units in the impact area include stratigraphic relationships, geomorphic expression and position, composition, paleosols, volcanic ash beds, and sedimentary structures. Except for the late Pleistocene glacial deposits, each unit was described in detail. Detailed descriptions included information about color, texture, pedogenic structure, sedimentary structure, boundaries and inclusions. Figure 2.4 illustrates the mapped geologic units and Figure 2.5 the stratigraphic relationships identified in the LAURD project area.

### Late Pleistocene Deposits

Three late Pleistocene units recognized within the impact area are glacio-fluvio-lacustrine deposits (Qf1), fluvial gravels and sands (Qsg), and landslide debris (Qsl). The units are pertinent to the archaeology of the area because the deposits, the processes forming them, and the resulting landforms afford either favorable or unfavorable sites for prehistoric utilization. The surfaces of these deposits, the T4 and T3 terraces, were the first surfaces available for human habitation.

Glacio-fluvio-lacustrine deposits, fluvial gravels and sands and landslide debris were not described in detail. The upper part of the fluvial sands which has been reworked by wind is described in detail since these secondary deposits relate to the stratigraphy of archaeological sites.

#### Glacio-fluvio-lacustrine Deposits (Qf1)

The oldest unit of unconsolidated sediments in the project area is composed of coarse-to-medium crossbedded sands with interbeds of very fine laminated silts and clays and moderately well-rounded, moderately well-sorted gravels. At Kennedy Gulch and Big Bend thickness of the deposit varies between 36 and 31 m (118 - 100 ft) respectively.

Cross beds and fore set beds in the sand unit have a down-valley dip indicating fluvial deposition from an upstream source. Horizontal finely laminated silts and clays indicate a slackwater depositional environment. The gravels and sands are obviously of fluvial origin whereas the silts and clays represent sedimentation in an ice-margin lake.

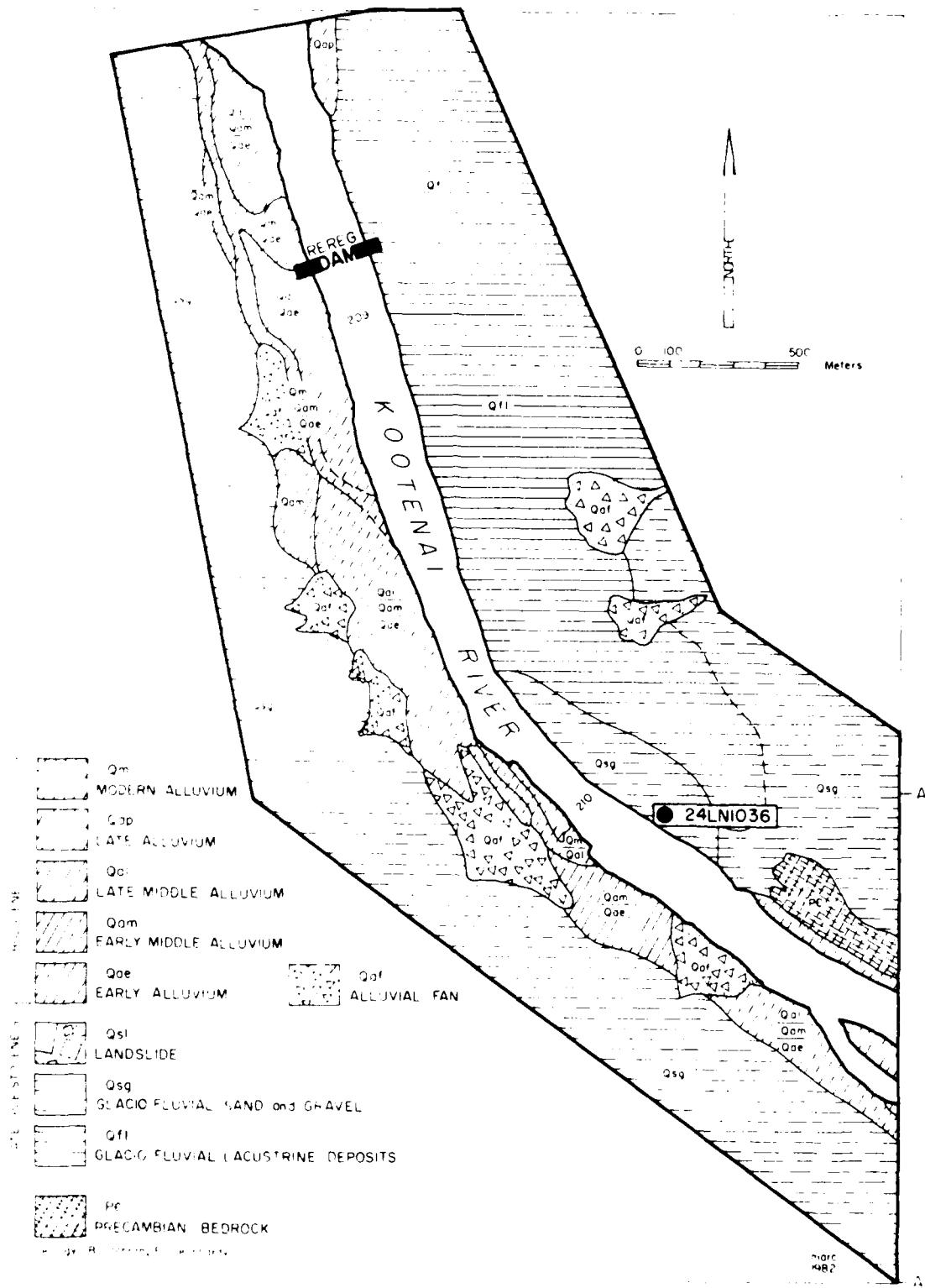


Figure 2.4. Geologic units in the LAURD project area.

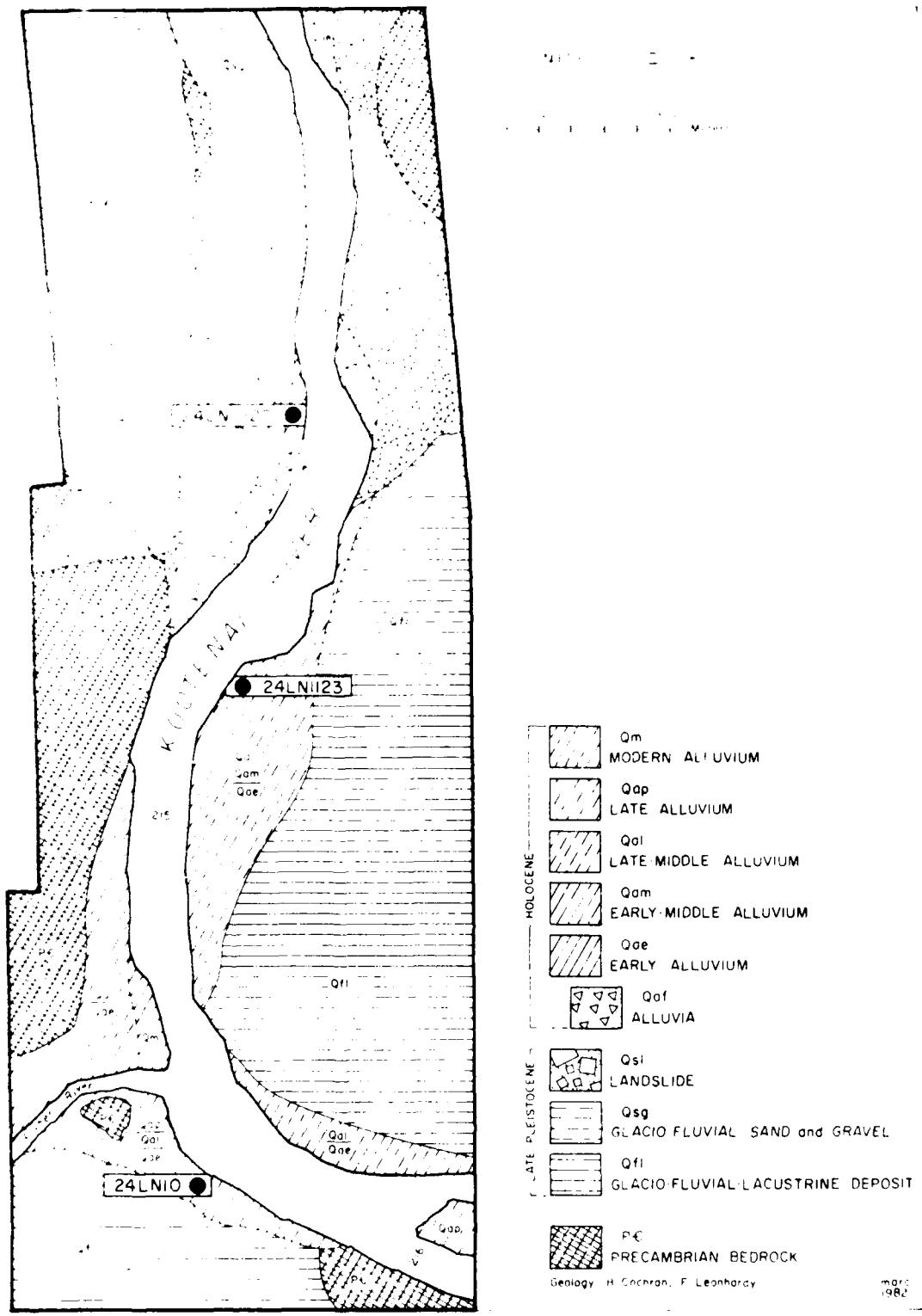


Figure 2.4. Geologic units in the LAURD project area (cont.).

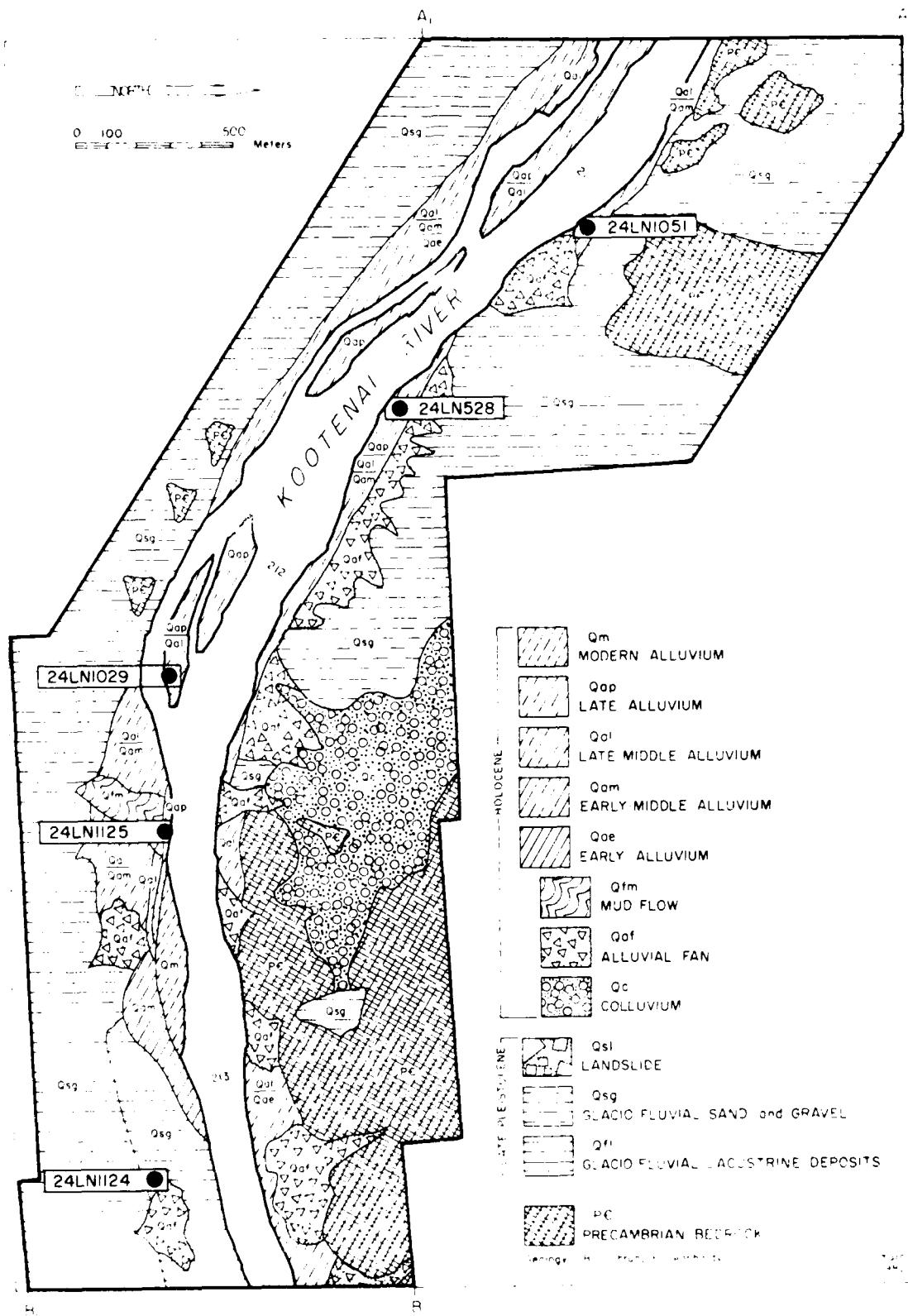


Figure 2.4. Geologic units in the LAURD project area (cont.).

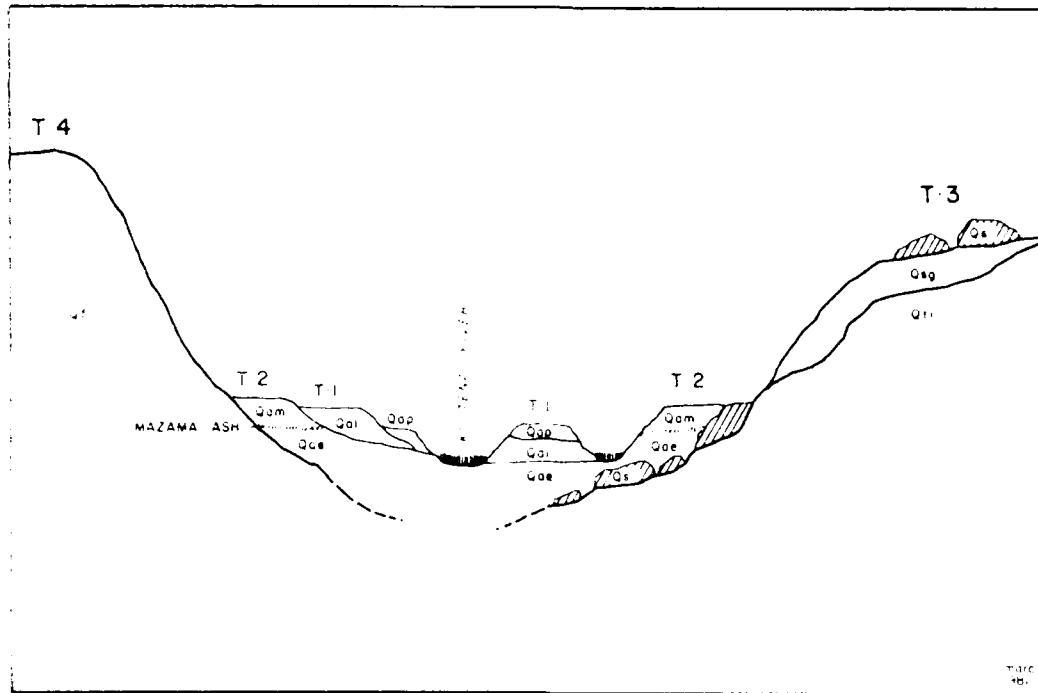


Figure 2.5. Generalized stratigraphic and geomorphic relationships of deposits in the LAURD project area.

Alden (1953:150-156) mapped extensive lacustrine deposits near Libby, Montana, which correlate to these deposits and which extend as far north as Gateway, Montana, near the Canadian border. Age of the glacio-fluvio-lacustrine deposits has not been radiometrically determined. However, the estimated age is between 18,000 and 13,000 years ago -- sometime after continental ice recession during mid- or late Pinedale time.

Near the upstream end of the T4 terrace at Kennedy Gulch (T30N, R30W, NW1/4, SW1/4, SW1/4, Sec. 10, Swede Mountain 7.5 Quadrangle) and the downstream end of the Big Bend Terrace (T1) (T30N, R29W, SE1/4, NW1/4, NW1/4, Sec. 17, Tony Peak 7.5 Quadrangle) a poorly-sorted non-stratified, bouldery silt gravel unconformably overlies Qfl. These gravels are thin and not extensive. Poor sorting and the occurrence of several striated cobbles indicate glacial origin. However, since the deposit is thin and localized it may have been derived from melting icebergs. It is also possible that the poorly sorted gravels are a result of mass wasting. In either case a localized ice advance is not indicated. Because they are found at only two localities and are discontinuous they are included in the Qfl mapping unit.

#### Late Pleistocene Sands and Gravels (Qsg)

Sediments exposed in the T3 terrace at site 24LN1124 and at several barrow pits and road cuts are composed of well-rounded, moderately well-sorted gravels interbedded with and capped by well-sorted medium sands. The upper part of the gravel is calcareous and,

in some places, weakly cemented with calcium carbonate. Thickness varies from 18 - 24 m (60 - 80 ft). Over 90 percent of the unit lies below 671 m (2200 ft). A gradual change from faint crossbeds and parallel laminations at the base to massive sedimentary structures at the top of the overlying sand indicates a change from fluvial deposition to aeolian deposition. Except for several angular pebbles and cobbles marking a paleosurface, a prominent boundary between the lower fluvial and upper aeolian sand was not found.

Absence of lacustrine interbeds and lower geomorphic position indicate the deposit is younger than the glacio-fluvio-lacustrine unit. The part of the deposit found above 680 m (2230 ft) may be contemporaneous with glacio-fluvio-lacustrine deposits at Kennedy Gulch and Big Bend. Cultural materials of mid- to late Holocene age included into the upper 20 to 30 centimeters of the upper massive sands (24LN1124).

#### Landslide Debris (Qsl)

About one half of the Tony Peak Terrace (T3) is overlain by landslide debris (Qsl) composed of large blocks from the Striped Peak Formation (Pe undifferentiated). The base of the slide has been modified by subsequent fluvial erosion and then by railroad construction. Much of the landslide debris lies beneath the Jennings Terrace which is of Holocene age. Slide debris overlies late Pleistocene gravels and sands and underlies early Holocene alluvium, so the age of the landslide can be placed near the Pleistocene-Holocene boundary, 10,000 to 12,000 years ago.

#### Holocene Deposits

Six Holocene deposits have been described and mapped in the LAURD project area. A seventh mapping unit consisting of late Pleistocene and Holocene colluvium (Qc) is mapped but not described. Mazama ash is a distinctive stratigraphic unit which does not occur in a mapable position. It is included as a member of the Early-Mid Holocene Alluvium mapping unit and always marks the base of that unit. The mapped stratigraphic units include four distinct alluvial deposits, Qae, Qam, Qal, Qap, and one mudflow deposit, Qfm. Alluvial fan gravels (Qaf) interbedded with flood plain alluvium form distinctive geomorphic and stratigraphic features and are mapped separately.

#### Flood Plain Alluvium

##### Early Holocene Alluvium (Qae)

Early Holocene alluvium (Qae) consists of well-sorted, well-rounded channel gravels conformably overlain by alternating horizontal beds of coarse to fine sand and silt. Boundaries between upward fining units of sand and silt are sharp near the base of the sequence and become diffuse near the top. Locally, the early alluvium is capped by a very weakly developed paleosol with an AC horizon

deposits. This soil often is baked and contains abundant charcoal. At site 24LN1125 the baked A horizon is extensive and probably represents a period of surface stability in that soil forming processes outpaced sediment accumulation.

Whether the deposits mapped as early Holocene alluvium (Qae) represent laterally accreting point bars or whether they record accumulation in an overbank portion of the flood plain is not entirely certain. The sediments extend laterally (perpendicular from the river) in horizontal, parallel beds in Terrace 2 at 24LN1020 and site 24LN1125. In these locations, at least, the alluvial deposits were laid down during overbank flow.

Charcoal from the buried A horizon which caps the deposit at 24LN1040 was radiometrically dated at  $8170 \pm 100$  BP (TX3220). Similar stratigraphic sequences, topographic relationships, and the occurrence of overlying primary deposits of Mazama ash indicate that the deposits at 24LN1040, 24LN1125, and 24LN1020 are contemporaneous. The upper age limit for the early Holocene alluvium is the age of Mazama ash, about 6700 radiocarbon years BP. Because the ash overlies the early alluvium the terminal date for deposition is earlier by some unknown magnitude. A lower limiting age for the unit has not been determined; however, the early Holocene alluvium certainly postdates landslide debris (Qsl) at Jennings. The maximum initial date is probably no earlier than 10,000 BP.

#### Alluvial Fan Gravels (Qaf)

Alluvial fan gravels (Qaf) are interbedded with and overlie early to late Holocene alluvium at the mouths of nearly every tributary. These gravels are composed of very angular, poorly sorted, poorly bedded mudstones (siltites and argillites) and shales of the Striped Peak Formation and reworked well-rounded glacial gravels. Age of the alluvial fans ranges from late Pleistocene to late Holocene. The fan gravels represent processes that have been continuing since the valley has been free of ice margin lakes or stagnant ice blocks.

#### Early Middle Holocene Alluvium (Qam)

Early Holocene alluvium is unconformably overlain by an alternating sequence of alluvial sand and silt which grades laterally to massive very fine sand and coarse silt (Qam). At several localities, however, these massive deposits conformably overlie primary deposits of Mazama ash (profile 1034 and trench 6, 24LN1125 and 24LN1020, respectively) and probably represent an aeolian depositional environment.

A lower limiting age is provided by primary deposits of Mazama ash ejected from Mount Mazama (Crater Lake) 6,700 years ago. Although charcoal found near the top of the unit at 24LN1125 has been dated at  $4,830 \pm 950$  BP (TX3300) a more exact upper limiting age remains undetermined.

### Late Holocene Alluvium (Qap)

Deposits of late Holocene age (Qap) are cut-and-filled into older alluvium. These sediments form much of site 24LN1029 and several other mid-channel bars (islands) in the Kootenai River between Libby Dam and Libby, Montana. At site 24LN528 the younger alluvium unconformably overlies calcium carbonate coated channel gravels that are probably of early Holocene age. Late Holocene alluvium is characterized by alternating beds of coarse, medium, and fine sands and silt capped by thin AC soil profiles. Basal channel gravels at site 24LN1029 represent high stream energy prior to deposition of the firer alluvium. Cultural debris at site 24LN1029 is contained in several different gravel lenses and in overlying sands. A radiocarbon date of  $2350 \pm 70$  BP (TX 3226) was obtained from charcoal found in the middle of the unit at site 24LN1029. Maximum and minimum age for the deposit has not been determined.

### Holocene Mudflow Deposits (Qfm)

Mudflow deposits (Qfm) occur in the middle part of site 24LN1125 at Area C. Surface expression varies between 0.5 and 1.5 meters above the terrace level and forms a lobate mound across much of the site. The deposit consists of angular siltite and argillite gravels and boulders with an occasional rounded cobble of glacio-fluvial origin. Interstices are filled with silt and sand. Several rounded and angular rip-up clasts of very finely laminated lacustrine silts and Mazama tephra were found in the unit. The mudflow deposits overlie the late middle Holocene alluvium (Qal) and its associated soil. Weak B horizon development at this locality exhibits striking contrast to B horizons in adjacent areas. Minimal A2 and B2 development predominates where the mudflow overlies the middle alluvium. Another curious contrast is the absence of cultural material in buried surface horizons when compared to a nearly continuous cultural deposit over the entire terrace where the soil has not been buried. Clasts of Mazama ash clearly indicate the mudflow occurred after the Mazama ash fall, 6,700 radiocarbon years ago. The deposit is younger than  $1450 \pm 950$  BP (TX3299), a date from charcoal found at the contact of the mudflow debris and underlying alluvium and capping soil.

### Summary

Stratigraphic studies of deposits exposed in road cuts, cut banks, backhoe trenches, borrow pits, and archaeological excavations indicate the following minimal sequence of geologic events.

1. Late Pleistocene continental glaciation followed by ice recession and occupation of the Kootenai River valley by ice marginal or proglacial lakes.
2. Formation of Terrace 4.
3. Drainage of the lake system and the formation of Terrace 3.
4. Deposition of the channel lag gravels, point bar gravels, and the overlying alluvium (Qae) to form the constructional T2

- terrace; alluvial fan construction between the time of ice recession and the deposition of Mazama ash.
5. A brief episode of surface stability and formation of the weakly developed soil in the Early Holocene Alluvium.
  6. Erosion of the Early Holocene Alluvium followed by deposition of Mazama ash and deposition of the Early Mid-Holocene Alluvium (Qam); continued alluvial fan accretion.
  7. Erosion sometime after the Mazama ash fall but before 4,888 BP; deposition of the Late Mid-Holocene Alluvium (Qal).
  8. A period of stability and intense soil formation with strongly developed Bt or Bir horizons forming in Late Mid-Holocene Alluvium and earlier deposits.
  9. Erosion followed by deposition of the Late Holocene Alluvium (Qap) beginning sometime before 2,300 BP and continuing to modern times; continued alluvial fan aggradation.
  10. Modern channel cutting and development of weak soils on the Late Holocene Alluvium.

#### CORRELATION OF ARCHAEOLOGICAL SITES

Stratigraphic position, geomorphic expression of sedimentary units, and replication of depositional sequences are the principal methods employed for correlating deposits in the LAURD project area. Additional means are provided by modern and ancient soils, primary volcanic ash deposits, and radiocarbon dates. Since the Kootenai valley has been burned periodically during the Holocene by forest fires careful examination of the stratigraphic provenience must be conducted before charcoal samples can be collected for radiocarbon assessments or the dates used to interpret the chronology of geologic and cultural events.

#### Radiocarbon Dates

Modern and ancient tree roots younger than the deposits in which they are anchored occasionally burned far below the surface during intense fires. Consequently, efforts to develop radiocarbon chronologies are difficult. For example, radiocarbon samples from 24LN1125 dated at  $1340 \pm 80$  EP (TX3298) and  $1480 \pm 80$  BP (TX3301) lie beneath a B2ir soil horizon and are contained in sediment radiocarbon dated at  $2530 \pm 145$  BP (TX7290) and  $2690 \pm 70$  BP (TX3295) at the same site. That the younger dates are from "intrusive" charcoal is substantiated by a charcoal sample from 24LN1125 dated to  $1950 \pm 50$  BP (TX3299). This sample of charcoal was found *in situ* on a buried organic layer that overlies the same B2ir soil horizon. The younger dates on charcoal in older alluvium probably record an ancient forest fire or were implanted by extreme bioturbation.

## Soils

Soils developing on late Pleistocene and Holocene sediments exhibit a wide range of characteristics (diagnostic horizons and features) related to age and mineralogy of the deposit, climate, microclimate, vegetation type and density, topography, and aspect. Most soils in the project area are weakly developed. Some, however, have surprisingly strong and varied horizon development.

Soils developing on late Pleistocene deposits are best illustrated by profiles at 24LN1124. Also, at several locations on the Tony Peak Terrace a weak B2 horizon is developing into late Pleistocene fluvial and aeolian sands. Lack of Mazama ash and absence of a strongly developed B horizon suggests that soil began forming during mid-Holocene time, well after the Mazama ash fall. The weak B horizon development is probably controlled by the mineralogy and textural properties of the sediment which is quartz rich (about 80%) so minimal development is not solely a function of time. Several pits excavated in 1978 on the western edge of the Tony Peak Terrace had similar soil profiles and depositional sequences. Iron pan development, however, was stronger. This could be a result of topographic position at these localities in which hydrous iron and manganese were removed from higher topographic positions and reprecipitated in topographic lows.

Soils developed on Early Holocene Alluvium (Qae) are characterized by thin AC horizon sequence. Locally, this paleosol (I) has been burned and contains abundant charcoal radiometrically dated at  $8170 \pm 100$  BP (TX3220) (24LN1046).

Two distinct soils of similar age have developed or are developing into Middle Holocene Alluvium (Qam). These are clearly defired at 24LN1125. Lateral variation of the B horizon from a B2t to a Bir is difficult to explain in terms of single pedogenic cycle. We suggest that the variability is a result of polygenesis, several pedogenic cycles in which one or more soil forming factors have been changed. For example, one set of soil forming processes developed the B2t horizon which has undergone or is undergoing alteration by alluviation—a process that is directly influenced by vegetation type and microclimate. Micro-relief may have had some influence because the B2t/Bir varies from 20 to 40 centimeters in relief at site 24LN1125.

At several places the A2 horizon has completely encased strong prismatic peds. It has destroyed the prismatic structure at other localities. The resulting B horizon is characterized by a weak subangular blocky structure.

Soils developing on alluvium younger than 2000 years are characterized by AC sequence over a B2b/C horizon sequence.

Pollen percentages are based on the sum of nonaquatic taxa, with aquatic percentages calculated using the nonaquatic sum as 100 percent. At Tepee Lake sedge pollen is so prevalent that Cyperaceae is tallied as an aquatic taxon, since it is quite unlikely this amount (often 100 percent based on the nonaquatic sum less Cyperaceae) represents primarily terrestrial sedge production. At McKillop Creek Pond however the percentage of Cyperaceae pollen is generally much lower and is included in the terrestrial pollen sum.

#### POLLEN ZONE SEQUENCE

Pollen preservation varied throughout both cores, with good preservation only in the upper 1.5 m. This contributed to the relatively large number of indeterminate (i.e. corroded, crushed and torn pollen grains) in many levels. In spite of altitudinal differences (340 m) between the two sites it is possible to use the same pollen zonation for both cores (Figs. 3.2 and 3.3). This reflects apparent synchrony in vegetation change since ice withdrawal (or synchrony in initial receipt of sediment at both sites, which are about 10 km apart).

##### Pollen Zone I (prior to 11,000 BP)

Predominantly AP taxa characterize the initial pollen deposition at Tepee Lake (480-500 cm). Pinus pollen, primarily haploxylon, is 75 percent of the nonaquatic pollen sum. Abies and Picea are also conspicuous (up to 4 percent) in this assemblage, considering the low productivity and dispersibility of these pollen taxa. Other than the ubiquitous Alnus, other AP (Larix/Pseudotsuga-type, Betula and Salix) are minor components. NAP contribution is composed principally of Artemisia and Gramineae (both 7 percent) and various Composites plus Chenopods (Amaranthaceae are unlikely in this flora, including in the Holocene). The aquatic pollen record contains only Nuphar and sedge.

Initial pollen deposition at McKillop Creek Pond may be equivalent to this unit. In general the pollen spectrum from 550-560 cm inclusive at McKillop Creek is consistent with Pollen Zone I (i.e., abundant pine, prominent Abies and Picea, have NAP), although it is not possible to correlate further without absolute dating.

##### Pollen Zone II (ca. 11,000 to 7,000 BP)

Prior to  $10,680 \pm 100$  BP (TX3659) Artemisia at Tepee Lake increased rapidly from  $\leq 7$  to  $\geq 15$  percent with a similar (although erratic) increase in Gramineae pollen. Throughout this zone Artemisia is the most prevalent NAP type, and a major component of the nonaquatic pollen sum. Spruce and fir decline from the comparative prominence in Zone I and occur only sporadically in Pollen Zone II. Pine continues to comprise generally 50 percent of the pollen sum with approximately equal representation of haploxylon and diploxylon pine pollen. The Larix/Pseudotsuga-type occurs with regularity through the

supports E. chamissonis with a very dense root mat. Repeated attempts to sample this material with the Livingstone sampler as well as the diffuse sediments below it proved futile. Consequently, the diffuse material (at depth 1-2 m) was not sampled, and the Eriophorum mat (at depth 0-1 m) was removed in consecutive 25 x 25 x 40 cm thick blocks with tiling spade and knife. All samples were wrapped in multiple layers of Saran wrap immediately after extraction from the sampling tube, and transported to the laboratory in rigid paper cylinders. Samples were stored at 4°C until prepared for pollen extraction.

At each site two cores taken in close proximity of each other (<2 m apart) were correlated stratigraphically prior to any sampling. Pollen samples (1 cm<sup>3</sup> cubes) were removed from the center of cores at 10 cm intervals using sections of both cores to obtain a complete set of stratigraphically consecutive samples to bedrock.

Pollen preparation procedure followed standard extraction technique (Faegri and Iverson 1964), including hot 10% KOH, hot 10% HCl, cold concentrated HCl, and acetolysis. Samples with a mineral fraction were treated in HF (at stirred room temperature for 2-4 days, then heated acid for 20 min.). Approximately 40 of the 110 samples required sonification for 1 min. prior to sieving to facilitate disaggregation. Large detritus was retained on a 200  $\mu$  mesh wire screen during the HCl wash. All samples were prepared for pollen concentration estimates by initially adding Lycopodium tracers (Stockmarr 1971) to each 1 cm<sup>3</sup> sample (5 tablets; 12,500±500 spores each). Pollen was mounted in silicone oil (2000 centistokes).

Routine counting was done at 400X and multiple slides per level were needed for the samples from both sites. A separate scan of these slides at 800X was used in constructing the haploxylon/diploxylyon ratios for selected levels and for determination of the Pseudotsuga/Larix-type. Samples of peat (<5 cm of the core length) were removed for radiocarbon dating from both cores used for pollen analysis (Table 3.1). None of the sediments at either site are calcareous. A composite stratigraphic description was prepared from the pair of cores used from each site.

Table 3.1. Radiocarbon dates from Tepee Lake and McKillop Creek Pond.

<u>Location</u>	<u>Date (BP)</u>	<u>Lab. no.</u>
Tepee Lake	2770 ± 50	(TX3657)
Tepee Lake	4620 ± 100	(TX4478)
Tepee Lake	5510 ± 50	(TX3660)
Tepee Lake	6420 ± 140	(TX3661)
Tepee Lake	7340 ± 200	(TX3662)
Tepee Lake	9430 ± 200	(TX3658)
Tepee Lake	10680 ± 100	(TX3659)
McKillop Creek Pond	1990 ± 80	(TX3335)
McKillop Creek Pond	3700 ± 120	(TX3736)
McKillop Creek Pond	3880 ± 350	(TX3737)
McKillop Creek Pond	4820 ± 140	(TX3738)
McKillop Creek Pond	5930 ± 110	(TX3739)

was 410 mm annually for the period 1975-1979 inclusive. Mean temperatures for January and July over the same period were -6° and 19° C, respectively. But this site is >630 m below the elevation of Tepee Lake. Perhaps a more comparable climatic record to that at either study site is seen at McGinnis Meadows (referred to as Libby 32 SSE in U.S. Environmental Data listings) 20-25 km south of both study sites. At McGinnis Meadows (elev. 1100 m) annual precipitation (1975-1979 inclusive) was 605 mm. Mean January and July temperatures were -7° and 17° C, respectively (U.S. Environmental Data Service 1975-1979).

Upland vegetation in the immediate vicinity of both sites is seral, reflecting logging and burning at Tepee Lake and extensive logging around McKillop Creek Pond. The terrestrial seral stand adjoining Tepee Lake is on an Abies grandis/Clintonia uniflora habitat type (hereafter referred to as h.t.) (Pfister et al. 1977), which is equivalent to the A. grandis/Pachistima myrsinites unit recognized for northwestern Montana and further west by Daubenmire and Daubenmire (1968). Along with grand fir the stand contains (in approximate decreasing order of cover) Pinus contorta, Pinus monticola, Pinus ponderosa, Larix occidentalis and Picea engelmanni. Within 100 m of the fen upslope on west exposures Pseudotsuga menziesii dominates. The sparse understory contains Calamagrostis rubescens, Spiraea betulifolia, and Pachistima myrsinites.

Terrestrial vegetation surrounding McKillop Creek Pond consists of several hemlock stands of varying maturity. All stands occur on the Tsuga heterophylla/Clintonia uniflora h.t. (Pfister et al. 1977). While hemlock is the most prominent arboreal species, A. grandis, P. engelmanni, P. menziesii, P. contorta, L. occidentalis, and P. ponderosa also occur in the vicinity of the fen. The understory includes C. uniflora, Rosa gymnocarpa, Rubus parviflora, Shepherdia canadensis and Symporicarpos albus.

Both study sites are currently fens supporting an extensive cover of sedges (Carex, Eriophorum). At Tepee Lake sedge occurs with Dulichium arundinaceum and Potentilla gracilis. A small (< 100 m<sup>2</sup>) area of open water at the center of the depression supports Nuphar. The surface of McKillop Creek Pond is covered by Eriophorum chamissonis plus P. gracilis and Carex vesicaria. At the fen margin Menyanthes trifoliata and Scirpus sp. are prominent.

#### METHODS

Multiple 5-cm diameter cores were extracted with a square-rod Livingstone sampler in July 1979 at both sites. Five cores which extended to bedrock were collected at Tepee Lake (8.5 ha). Cores used in this study were removed in the W 1/3 of the Tepee Lake fen surface, 13 m from the N fen margin. Four cores (within a 3 m radius) were removed to bedrock 28 m from the W margin of the fen near the center of the smaller (.3 ha) of two heretofore unnamed ponds on McKillop Creek (hereafter the sample site will be referred to as McKillop Creek Pond). Length of core samples (extracted with each 100 cm plunge of the sampler) was measured in the field and correction was made for any compaction or loss in sampling. The surface of McKillop Creek Pond

al. 1965). Finally, as part of a larger survey of archaeological remains in the Kootenai River drainage, the study provides information as to the macro-environment (and its change) as experienced by early human inhabitants.

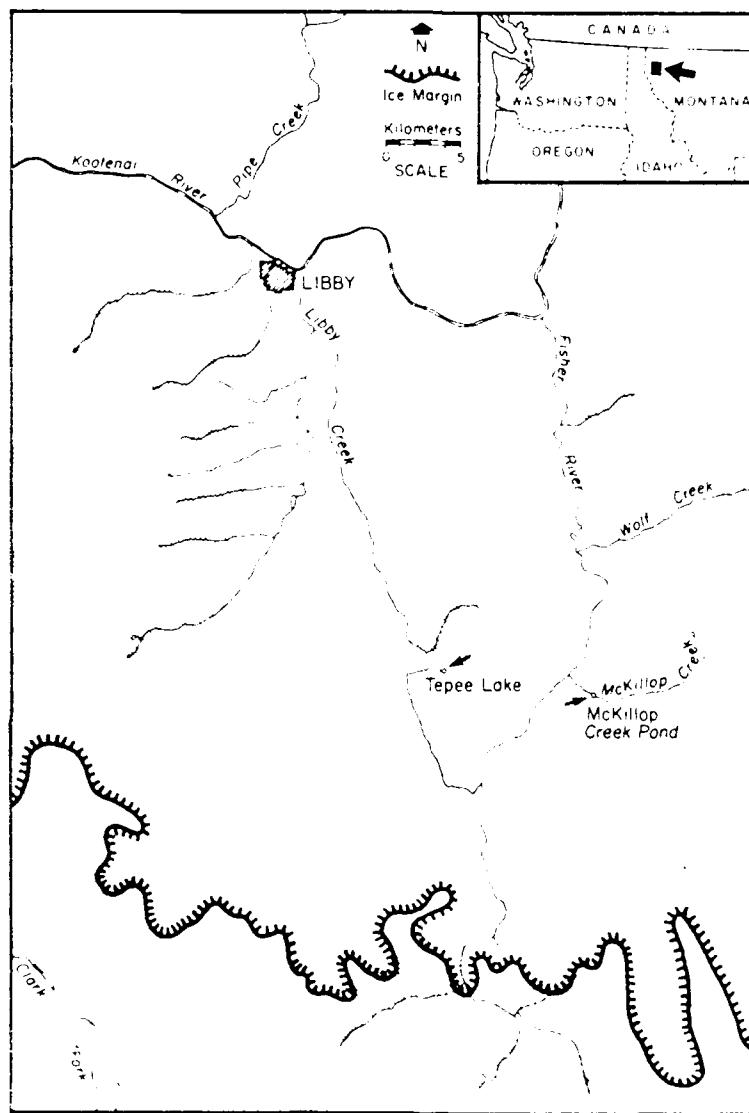


Figure 3.1. Pollen sampling sites in Lincoln County, Montana.

#### MODERN CLIMATE AND VEGETATION

The study region is within the Cabinet Mountains of western Montana (Fig. 3.1), a region in which considerable diversity in climate and vegetation occurs as a function of topographic relief and aspect. As a result climatic information collected < 40 km from the two study sites may reflect little as to the current macroclimate in the immediate area of these fens. For example, at the Libby Ranger Station INE outside Libby, Montana (elev. 634 m) mean precipitation

3. POLLEN ANALYSIS OF CORES FROM TEPEE LAKE AND McKILLOP CREEK POND,

LINCOLN COUNTY, MONTANA

by

Richard N. Mack

INTRODUCTION

Vegetation history in mountainous areas presents a considerable challenge to the Quaternary palynologist as quite different vegetation units may be in juxtaposition, their local distribution controlled by extreme altitudinal temperature gradients and aspect. The record of nonaquatic pollen seldom reflects only one terrestrial vegetation unit, but rather strict thanatocoenoses with the pollen on non-ecological associates occurring together only in death. A regional picture of macro-environmental change via pollen records prepared from such topographic relief requires particular attention to local modification.

Perhaps for the difficulties of interpretation cited above interest in the late Quaternary geology of the Rocky Mountains has not been accompanied by an equivalent effort examining contemporaneous vegetation change. There are surprisingly few studies of the Holocene vegetation history in (or along the flanks of) the Rocky Mountains (e.g., Hansen 1949; 1952; 1955; Heusser 1956; Maher 1972; Waddington and Wright 1974; and Baker 1976). Even fewer diagrams have been prepared for sites in the northern Rockies of the coterminous United States (Hansen 1943; Hansen 1948; Mehringer, Arno and Petersen 1977).

Western Montana (U.S.A.) is characterized by a group of distinct NW-trending mountain ranges with narrow intervening valleys all within the Rocky Mountain system. Within this region the Kootenai River drainage, flanked to the N and S by the Purcell and Cabinet Mountains respectively, is typical of this topographic pattern. Closed depressions within the Kootenai and Fisher river drainages provide the opportunity to examine Holocene change in the Rocky Mountains with a contemporaneous regional pattern to the west (Mack et al. 1978a, b, c & d). Furthermore, records from the Kootenai and Fisher drainages may be used to interpolate with some justification sequences elsewhere along the Rocky Mountain Range. Such records also provide a further contribution to the eventual elucidation of the nature of vegetation along the Late Wisconsin (Pinedale P-2) glacial maximum (Richmond et

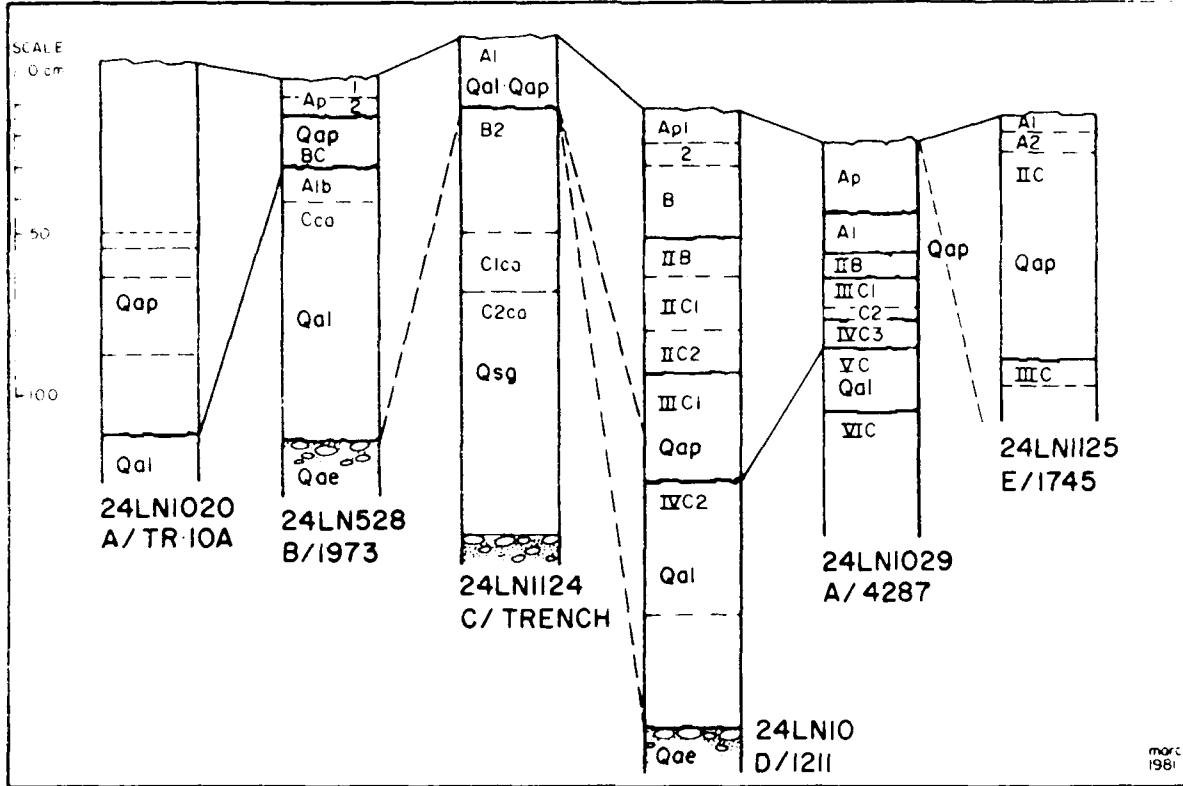


Figure 2.11. Stratigraphic sequence and relationship of Late-Middle (Qa1) and Late Holocene deposits. The uppermost unit at 24LN1124 is probably Late Holocene age.

In Area A, 24LN1125, well-rounded granule gravels are associated with abundant cultural debris (fire-cracked rock) and located in the A2 (albic) soil horizon. These gravels represent an episode when the Kootenai River flooded and planed the surface of this terrace. Extreme eluvial processes have subsequently masked otherwise recognizable depositional and/or erosional features that would normally be retained.

Late Holocene deposits (Qap) cap older sediments and are situated in cuts along the outside, or river edge, on terraces T1 and T2 and as a thin deposit on large portions of 24LN1125. These deposits are well stratified and consist of interbedded silt and sand. Abundant cultural debris, composed of fire-cracked rock and lesser amounts of cryptocrystalline chipping detritus, is found in the upper 10 cm of the unit.

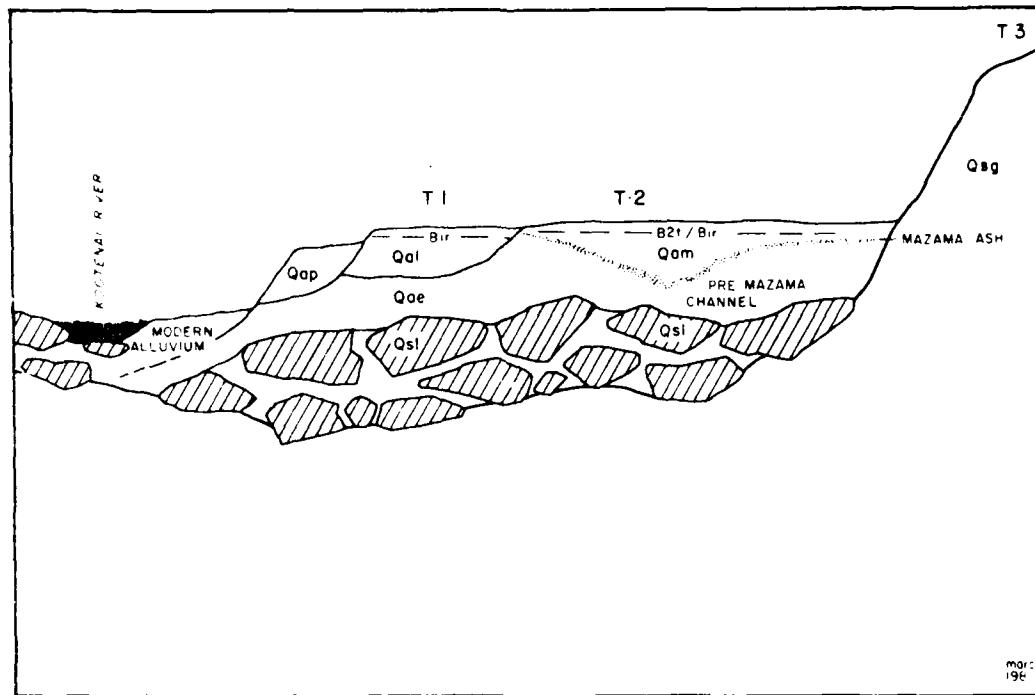


Figure 2.9. Generalized stratigraphic cross-section at 24LN1020 (Jennings Terrace).

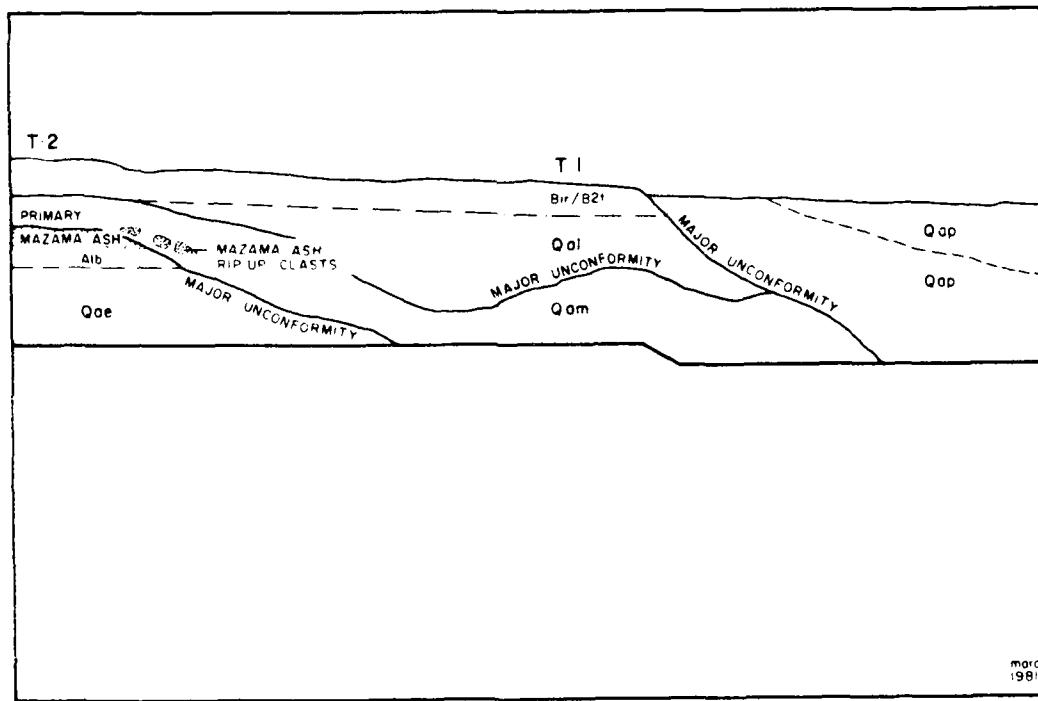


Figure 2.10. Generalized stratigraphic cross-section at 24LN1125, Trench E, showing the relationship of Early to Late Holocene deposits and soils.

Similar deposits situated in the same stratigraphic and geomorphic position which display similar sedimentary features are found at site 24LN1020 (Jennings) and site 24LN10 (Fig. 2.8). The sediments at both sites overlie an erosional unconformity and/or are formed in abandoned meander channels formed sometime before the Mazama ash fall of 6,700 years ago (Fig. 2.9).

The Mazama ash, radiocarbon dated between 7000 and 6500 BP in the Pacific Northwest, provides the means for correlating the unit throughout the study area as well as a lower limiting age for the unit at sites 24LN1125 and 24LN1020. Absolute upper and lower limiting ages, however, have not been determined in areas where the unit overlies a major unconformity (sites 24LN1125, Area E, pit 2263, and 24LN10, profile 10; Figs. 2.7 and 2.8).

Since the depositional sequence in these areas overlies an unconformity, lacks primary and secondary deposits of Mazama ash, and has a lower geomorphic and topographic expression (usually 20-50 cm), the unit must postdate the Mazama ash fall. A radiocarbon date of  $4830 \pm 950$  BP (TX3300) from UI pit N54-56, E96-97, 24LN1125, Area D, provides an approximate minimal age for the unit.

Late-mid-Holocene deposits (Qal) are nearly continuous throughout the study area. These deposits consist of interbedded silts and sands and contain abundant archaeological materials. At site 24LN1125, Area E, Trench E, these sediments overlie earlier alluvium and contain clasts of reworked Mazama ash (Fig. 2.10). The unit is capped by an O1, A2, B2t, B3, C soil horizon sequence. Laterally, the B2t horizon grades to a Bir horizon.

Upstream, at site 24LN1020, a similar B horizon displays the same lateral variability (pedologic variability has been explained in the preceding section concerning soils). Lateral correlation between Areas A, B, C, D, and E at site 24LN1125 to the Jennings site (24LN1020) is based on stratigraphic sequences, volcanic ash beds, and the distinctive soil developing on post-Mazama sediments.

Upper and lower limiting ages for late-middle Holocene alluvium have not yet been determined. However, radiocarbon dates of  $2690 \pm 70$  BP (TX3295) and  $2530 \pm 145$  BP (TX7290), from site 24LN1125, Areas A and E respectively correspond closely to a radiocarbon date of  $2350 \pm 70$  BP (TX3226), Area A, site 24LN1029. These dates indicate contemporaneity of the unit. Furthermore, the deposits (at all localities) overlie a major erosional unconformity.

The missing Bir or B2t horizon at 24LN1029 was either eroded, did not form, or the radiocarbon date was on redeposited charcoal. The stratigraphic sequence, which is replicated at 24LN1020, 24LN1125, and 24LN528 (Fig. 2.11), suggests that the unit was deposited simultaneously at all sites.

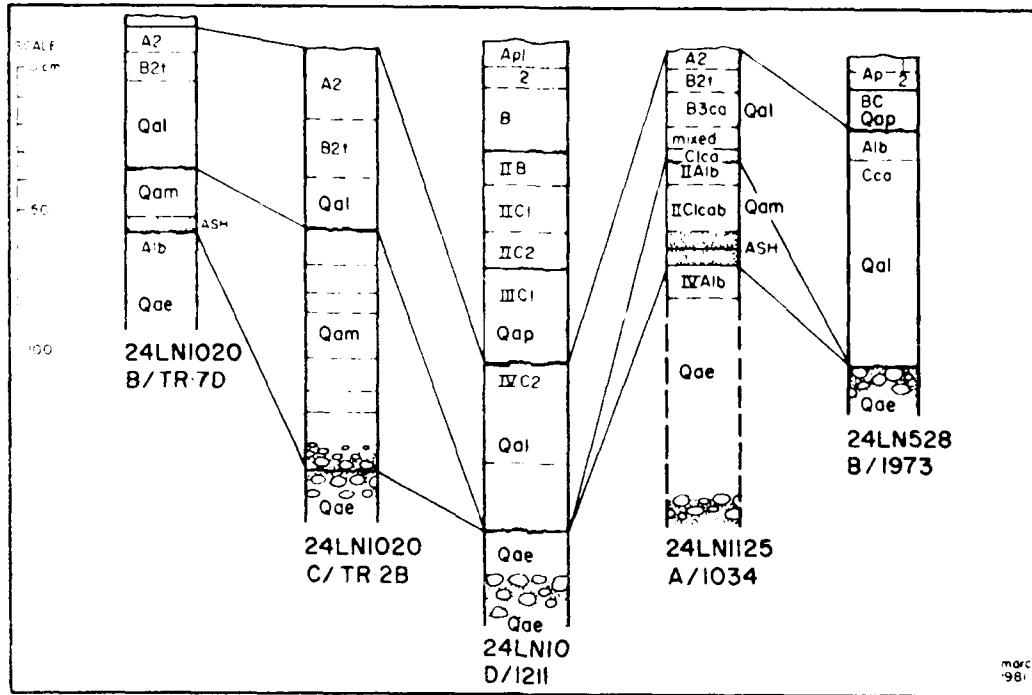


Figure 2.7. Correlation of Early to Late Holocene deposits at 24LN10, 24LN528, 24LN1020, and 24LN1125.

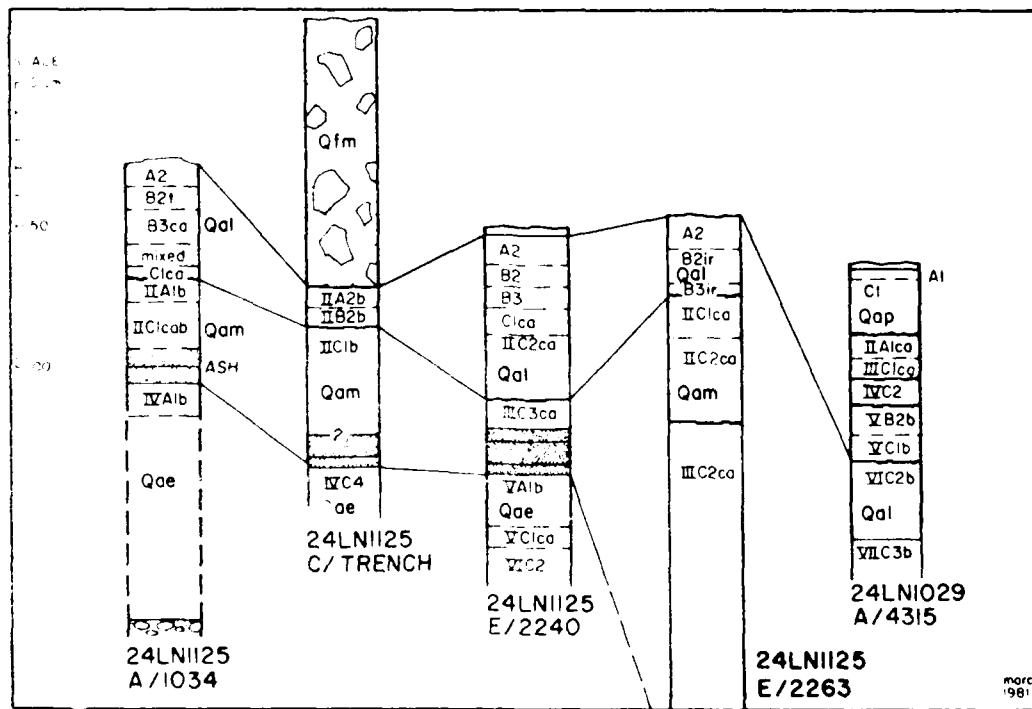


Figure 2.8. Stratigraphic relationships of Early and Late Middle Holocene alluvium at 24LN1125 and 24LN1029.

TABLE 2.2. Relative atomic weight and percentages of calcium (CaO), iron (FeO), and potassium (K<sub>2</sub>O) oxides of volcanic glass separates from site 24LN1125, Area A, pit 776.

Sample Number	Relative Atomic Weight			Total	Relative Percent		
	CaO	FeO	K <sub>2</sub> O		CaO	FeO	K <sub>2</sub> O
BCV1	1.62	1.67	2.39	5.68	29	29	42
BCV2	1.57	1.76	2.25	5.58	28	31	41
BCV3	1.60	1.76	2.32	5.68	28	31	41
BCV4 <sub>a</sub>	1.59	1.79	2.33	5.71	28	31	41
BCV4 <sub>b</sub>	2.09	2.46	2.03	6.58	32	37	31
BCV5	1.60	1.78	2.44	5.82	27	31	42

#### Site Correlations

Early Holocene alluvium (Qae) began accumulating sometime after the Kootenai valley, north of Libby, Montana, was freed from stagnant continental ice and/or after the river had cut through and removed sediments deposited in ice-margin lakes (Alden 1953). Deposits of early Holocene age which generally lack cultural debris are found throughout the study area. They are composed of "basal" gravels upward fining to stratified sands and silts. Commonly, the finer textured alluvium is capped by a locally burned A over C soil horizon sequence (Paleosol I). Charcoal from the buried A horizon (Paleosol I) collected in 1978 at site 24LN1046 was dated to 8170±100 BP (TX3220).

Lateral correlations throughout the study area to sites excavated in 1979 are provided by 1) similarity of sedimentary sequences, 2) a capping paleosol, and 3) an overlying ash bed which has been identified as primary Mazama ash (Figs. 2.6 and 2.7, Tables 2.1 and 2.2).

Middle Holocene deposits have been divided into two discrete units (Qam and Qal) on the basis of stratigraphic position, radiocarbon age, and sedimentary structures. Early-mid-Holocene deposits (Qam) either overlie primary deposits of Mazama ash or are situated cut-and-fill into older alluvium. At site 24LN1125, in areas A-D, sparsely distributed cultural materials are associated with the unit. In Area E of the same site, sediments of this age overlie an erosional unconformity.

TABLE 2.1. Oceanic glass element analysis for SiO<sub>2</sub>, Al<sub>2</sub>O<sub>3</sub>, FeO, MgO, CaO, Na<sub>2</sub>O, K<sub>2</sub>O, TiO<sub>2</sub>, and MnO. Two types of glass for sample BCV4 which were analyzed individually show contrasting values.  
All samples are averages of 10 runs on 10 glass particles.

	SiO <sub>2</sub>	Al <sub>2</sub> O <sub>3</sub>	FeO	MgO	CaO	Na <sub>2</sub> O	K <sub>2</sub> O	TiO <sub>2</sub>	MnO
BCV1	72.70±.55	14.53±.20	1.67±.14	0.43±.04	1.62±.07	3.93±.23	2.39±.14	0.41±.07	NO
BCV2	73.12±1.24	14.42±.20	1.76±.18	0.44±.05	1.57±.11	3.81±.20	2.25±.14	0.43±.06	NO
BCV3	72.67±.92	14.47±.16	1.76±.18	0.46±.04	1.60±.09	3.63±.23	2.32±.09	0.43±.04	NO
BCV4 <sub>a</sub>	71.98±.72	14.28±.22	1.79±.09	0.46±.02	1.59±.08	3.21±.44	2.33±.20	0.45±.05	NO
BCV4 <sub>b</sub>	71.50±1.01	15.28±.35	2.46±.22	0.63±.13	2.09±.37	3.72±.38	2.03±.13	0.53±.07	0.08±.02
BCV5	72.03±.98	14.29±.16	1.78±.11	0.47±.03	1.60±.50	3.64±.50	2.44±.12	0.45±.04	NO

area A, pit 776 are represented as solid triangles. With the exception of two different glass chemistries as noted by sample BCV4a and b, element analysis indicates the glass of samples BCV1, 2, 3, and 5 is the same as Mazama glass (Tables 2.1 and 2.2). Sample BCV4 was subdivided because two glass types were recognized. Elemental analysis on both types reveals a contrasting chemical composition for each type (Fig. 2.6). At this time there is no explanation for the disparity within this sample.

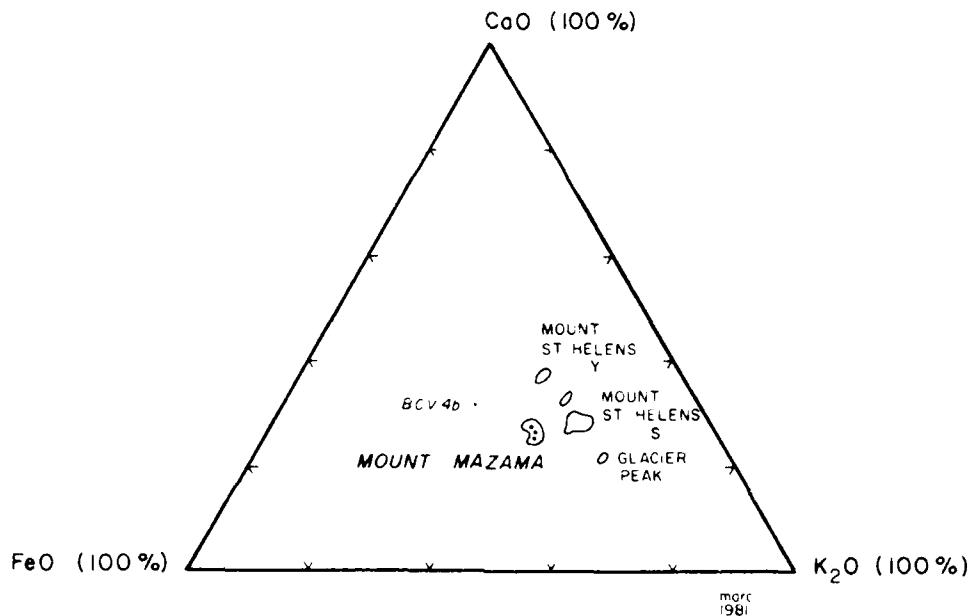


Figure 2.6. Relative percentages of CaO, K<sub>2</sub>O and FeO identified in Pacific Northwest volcanic ashes (dots represent LAURD ash samples).

Petrographic examination and glass elemental analysis of tephra samples demonstrate that the volcanic ash is derived from Mt. Mazama. Sedimentary structures indicate that the samples are primary air fall so the tephra may be used as a time stratigraphic marker horizon within the project area. It also provides a basis for regional geological correlations.

pinkish gray (5YR 7/2, dry), displays massive sedimentary structures, and is finer textured than sample BCV3. Thickness varies between 5 and 7 centimeters throughout the exposure. Sample BCV5 is a pinkish gray (7.5YR 7/2, dry) silt loam. It contains abundant muscovite, biotite, and other lithic debris which suggests the unit has been reworked and redeposited. Superposition, however, to the other ash layers indicates that redeposition occurred shortly after the primary ashfall. Thickness varies between 1.0 and 1.3 centimeters.

Massive sedimentary structures and absence of contaminants (lithic debris, muscovite, biotite, quartz, potassic feldspars, etc.) indicate that samples BCV1 through 4 are primary airfall tephra deposits. Abundant contaminants in sample BCV5 strongly suggest that this unit is a secondary deposit.

Many workers have estimated primary airfall thicknesses of the Mazama tephra but few have reported their findings. Primary thickness of Mazama tephra in the Vantage region of central Washington varies between 5.0 and 8.0 centimeters. At Challis, Idaho, primary Mazama ash is between 3.0 and 5.0 centimeters thick. However, reworking of the upper part of the ash may have reduced primary thicknesses and all that is preserved in the geologic record is that portion which has not been altered or disturbed by physical biological processes.

Secondary deposits of Mazama tephra are characterized by parallel laminations, cross beds, graded beds (in which heavier phenocrysts mark the bedding planes), abundance of muscovite, quartz, and lithic material, and over thickening at many sites. Similar features have been observed in reworked deposits of the May 18, 1980 Mount St. Helen's ashfall in eastern Washington and northern Idaho. Sedimentary structures that would indicate redeposition of Mazama tephra at the northwestern Montana sites are absent with the exception of contaminating debris in sample BCV5.

#### Summary

Several primary volcanic ashes found at sites 24LN1020 and 24LN1125 commonly overlie early Holocene deposits (Qae). Petrographic examination shows the ash is composed mostly of tubular glass (pumice) with a subordinate amount of platy glass. Refractive index of the tubular and platy glass varies between 1,506 and 1,508. The associated minerals are euhedral to subhedral and usually have volcanic glass attached to them indicating that they were formed during the magmatic eruption and not derived from local sources. The phenocryst suite includes hypersthene, clinopyroxene (probably enstatite), green and brown hornblende, plagioclase, and opaque minerals (probably magnetite). Petrographically, the ash beds at site 24LN1020 and 24LN1125 are identical and strongly resemble Mazama ash by having the same glass types, refractive index and associated minerals.

Figure 2.6 illustrates the relative percentages of calcium, iron, and potassium oxide of several Holocene volcanic ashes found in the Pacific Northwest. Element analysis of glass separates of six samples from five distinctive, superposed volcanic ash beds at site 24LN1125,

### Volcanic Ash

Since volcanic ash beds are used for correlating geologic and cultural events throughout much of the western United States, petrographic characterization of primary ash beds in the Kootenai drainage is necessary. In addition, glass elemental analysis conducted on the electron-probe microanalyzer is another technique used for positive identification of volcanic ashes. If the origin, optical and elemental characteristics, radiocarbon age, and stratigraphic provenience of primary volcanic ash beds are known then the ashes can be used as time marker horizons.

Volcanic ashes from the Mount Mazama eruption 6700 years ago were collected from floodplain sediments along the Kootenai River nine miles east of Libby, Montana. The collection sites are located in the SW1/4, SW1/4, NW1/4, SW1/4, Sec. 13, T30N, R30W, Swede Mountain Montana 7.5 minute quadrangle and the N1/2 Sec. 18, T30N, R29W, Tony Peak Montana 7.5 minute quadrangle. Total thickness of the ash is about 11 centimeters but lateral variations between 8 and 14 centimeters are common in terrace cuts and archaeological trenches between Jennings and Libby, Montana. The ash commonly overlies early Holocene alluvium (Qae) and/or is found at the base of early-middle-Holocene alluvium (Qam).

Charcoal from a burned A horizon beneath the ash at 24LN1046 has been dated at  $8170 \pm 100$  BP (TX3220). Usually the ash is found 50 to 80 centimeters below terrace surfaces. Deposits that are cut-and-filled into sediments containing the ash represent several episodes of erosion and deposition -- post ashfall. These overlying sediments are capped by a moderately well developed soil displaying an O1, A2, B2t (and B2ir), and C horizonation.

The tephra layer at site 24LN1125, grid 776, was divided into five units on the basis of color variation, textural changes, and abrupt, prominent boundaries. Sample BCV1 is a white (7.5YR 8/0, dry), massive siltloam (field determinations). Thickness varies from 1.5 to 2.0 centimeters at the collecting site. Absence of contaminating debris and massive sedimentary structures suggests primary airfall conditions. Many small worm burrows (3-5 mm diameter) penetrate the unit and the upper part of the underlying stratified floodplain silts. To ensure that samples were not contaminated during collection bioturbated portions were removed.

An abrupt boundary separates BCV1 from BCV2. Sample BCV2 is white (10YR 8/1, dry), exhibits massive internal sedimentary structures, and is a siltloam. Again, worm burrows have contaminated much of the primary deposit. Thickness of the deposit ranges from 0.5 to 1.0 centimeters.

Sample BCV3 is the coarsest of the five layers. It is pinkish gray (7.5YR 7/2, dry) and displays massive sedimentary structures. Boundaries between units BCV2, 3, and 4 are prominent. Unit BCV4 is

TEEPEE LAKE Lincoln Co., Montana  
Percentage Diagram

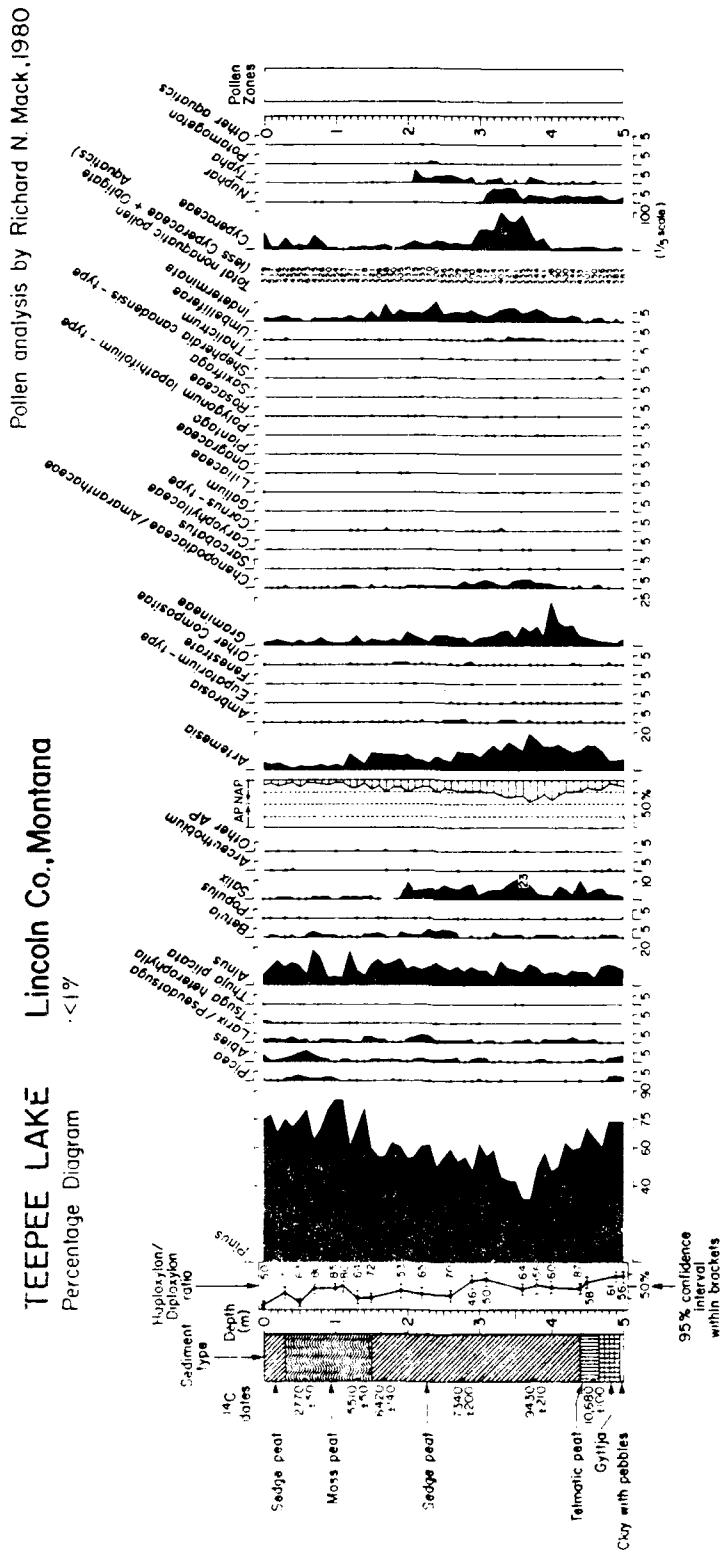


Figure 3.2. Pollen percentage diagram from Teepee Lake, Lincoln County, Montana.

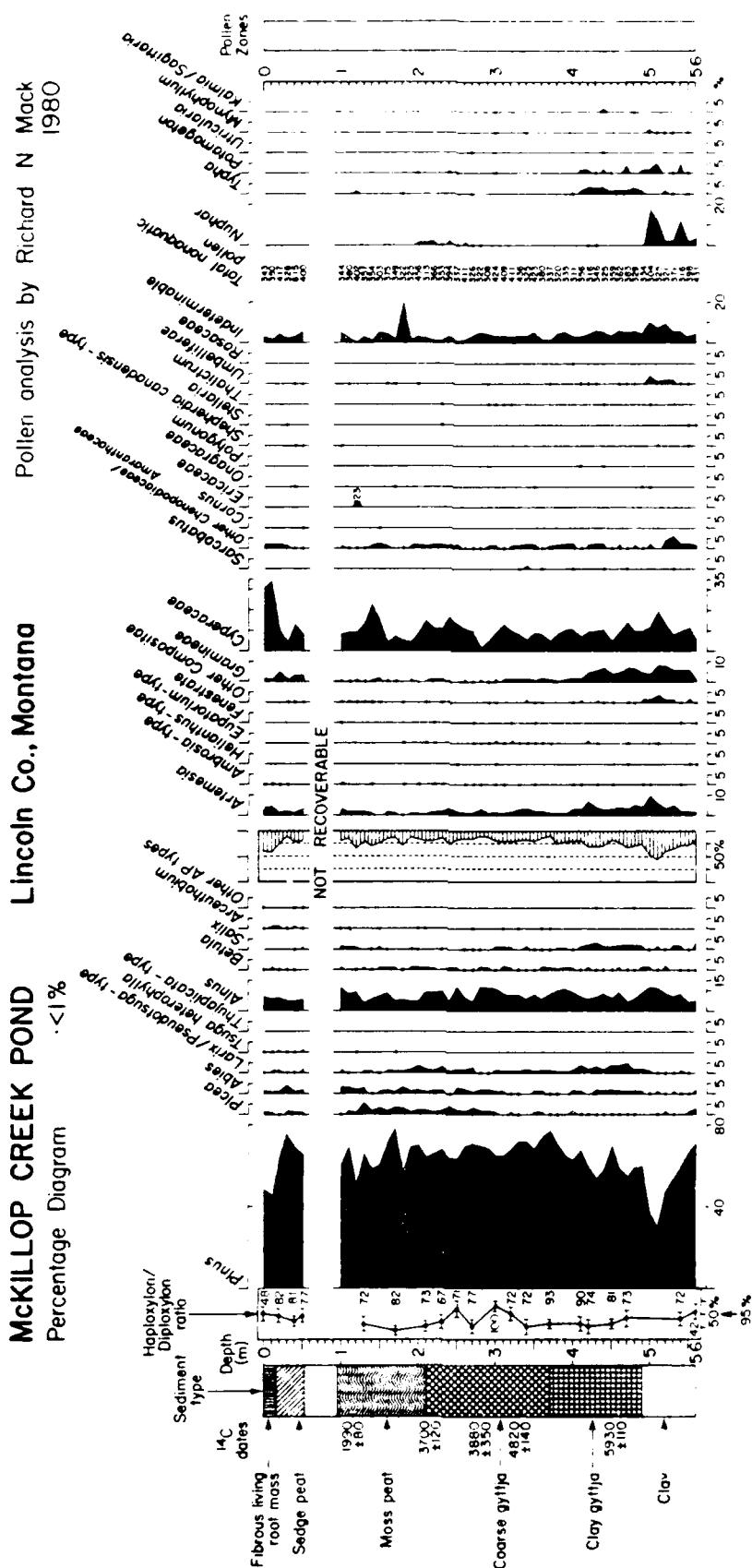


Figure 3.3. Pollen percentage diagram from McKillop Creek Pond, Lincoln County, Montana.

zone. In addition to various Composite (e.g. Ambrosia, Eupatorium-type and the Fenestrate-type) the Chenopods constitute the remaining consistent NAP types. Umbelliferae pollen is common but in low numbers in pollen records. But at both sites here the taxon is conspicuous (2-4 percent). Other NAP are both sporadic and rare (<1 percent). Excluding the probable local component around the fen of Salix and Alnus, about 50 percent of the terrestrial pollen record at Tepee Lake in Zone II (260-480 cm) and at McKillop Creek Pond (490-500 cm) is NAP.

Cyperaceae is also conspicuous in this zone, equivalent to 100 percent of the terrestrial pollen sum at Tepee Lake and 10-15 percent as included in the non-aquatic sum at McKillop Creek Pond. Typha, not present in Pollen Zone I, occurs here along with Nuphar.

#### Pollen Zone III (7,000 - ca. 4,000 BP)

Diploxylon pine becomes the most prominent pollen taxon in Pollen Zone III at Tepee Lake (110-260 cm), concomitant with the decline of Artemisia and Gramineae. Among conifers the Larix/Pseudotsuga-type is prevalent, particularly in Pollen Zone IIIa (410-490 cm) at McKillop Creek Pond. Picea occurs sporadically, while Abies is consistently present, but  $\leq$  2 percent. Except for Chenopods (and the low numbers of Gramineae and Artemisia) the NAP record is sparse. With the exception of Cyperaceae, aquatics in Zone III at both sites are poorly represented. Pollen Zone IIIb (300-410 cm) at McKillop Creek Pond may be differentiated in part by the abrupt drop of Typha and Potamogeton pollen coinciding with a decline of Salix. In addition the Zone IIIb brackets the interval at McKillop Creek Pond in which Artemisia and Gramineae decline to  $\leq$  5 percent.

#### Pollen Zone IV (4,000-2,500 BP)

At both sites a resurgence of Abies and Picea to as much as 5 percent of the pollen sum is recorded after 4000 BP (50-110 cm at Tepee Lake and 100-300 cm at McKillop Creek Pond). The Larix/Pseudotsuga-type is a prominent associate. Haploxylyon pine pollen increases in relation to diploxylon pine pollen. Increase in the AP types (> 90 percent of the nonaquatic pollen sum) occurs concomitant with a further decline (begun at the end of Zone II) in Artemisia to  $\leq$  5 percent. Grass and Chenopod pollen are also minor. The pollen zone is essentially devoid of any other NAP. Cyperaceae pollen becomes more prominent at Tepee Lake, while other aquatics remain rare or in low amounts (e.g., Nuphar).

#### Pollen Zone V (2,500 BP-Present)

Initiation of the modern dominant climax vegetation at both sites is denoted principally by the first sustained appearance of Tsuga heterophylla in the pollen record at McKillop Creek Pond above 100 cm. An approximately contemporaneous record of hemlock is seen at Tepee Lake above 60 cm. Abies and Picea continue to appear throughout Zone V, along with the Larix/Pseudotsuga-type. Other AP types are rare. NAP types such as Artemisia and Gramineae are minor taxa (< 4 percent).

#### PRELIMINARY ENVIRONMENTAL INTERPRETATIONS

Complete analysis of the two pollen diagrams awaits verification of any additional time-stratigraphic markers in the sections (e.g., possible presence of Mazama ash at Tepee Lake) and calculation of pollen influx estimates for Tepee Lake. Nevertheless the environmental picture emerging in the study area since Pinedale ice withdrawal is largely consistent with the multistage vegetation/climatic sequence seen further west such as in the Priest River valley.

Initial vegetation consisted of AP types, particularly haploxyロン pines, indicating cooler/possibly moister conditions than today. (This view is supported by the presence of *Artemisia* at this time--almost undoubtedly not arid land shrub [*A. tridentata* var *tridentata*] but rather high-elevation or more northerly occurring species such as *A. frigida* or *A. tridentata* var. *vaseyana*.)

These cool, possibly moist, conditions persisted at Tepee Lake through Pollen Zone II. The so-called "Artemisia Bulge" seen in Zone II is a widely observed pollen assemblage for the early postglacial. Chief evidence of a shift to warmer/drier conditions after 7000 BP is the prominence of diploxyロン pine, *Pinus ponderosa*. *P. contorta* was probably also included here, but the combination of diploxyロン pines with Larix/Pseudotsuga strongly suggests conditions both warmer and drier than today by the time of Pollen Zone III. Evidence for a brief reversal of climate to cooler/moister conditions by 4000 B.P. is not unequivocal, simply because the time frame is not long enough for the increase in Abies and Picea to be unattributable to succession.

A climatic explanation for an increase in Abies and Picea is consistent with similar longer records found to the west (at Big Meadow in NE Washington). Here in the study area as seen further west the emergence of the modern macroclimate in the last 3000 years is documented by the appearance of Tsuga heterophylla. Considerable confidence can be placed in this assessment as hemlock is a member of the climatic climax in all forests in which it occurs in our region, i.e., there is little possibility of the tree occurring on habitats of compensation and not reflecting the current macroclimate.

4. TOWARD A MODEL OF PREHISTORIC SUBSISTENCE IN THE CANYON LOCALITY

OF THE

KOOTENAI RIVER REGION

by

Tom E. Roll and Craig Henry

INTRODUCTION

The purpose of this discussion is to examine the carrying capacity of the LAURD project area and surrounding environs for humans with a basic hunting and gathering technology. The concept of carrying capacity is complex and certain underlying assumptions are unrealistic (Pianka 1974:82-87). The concept does have utility so long as it is viewed as a theoretical abstraction, not a reality. Basically, carrying capacity implies the maximum number of individuals that a given habitat at a particular point in time is capable of sustaining, the peak of a sigmoid population curve. In reality, the carrying capacity of a particular habitat is rarely, if ever, attained. Natural populations tend to achieve a dynamic equilibrium with their environment that sustains the population substantially below the theoretical capacity. With recognition of the limitations of the concept and the available data, the results of this attempt should provide a useful model of the resource potential to sustain aboriginal populations at particular technological levels.

The elucidation of prehistoric subsistence systems presents the archaeologist with a complex challenge. Environmental change over time, differential consumption by humans (the entirety of some plant foods as compared to only the meaty portions of most animals), differential preservation of different resources in the archaeological site, the use of particular tools in one region to take a specific animal whereas the same tool may be used for different animals in adjacent areas, and cultural selectivity are all factors that obscure the subsistence adaptation. Despite these difficulties, an examination of the archaeologically documented resources provides some insights into the nature of prehistoric subsistence and, more importantly, leads to new lines of inquiry.

Ideally, the archaeologist would have information on site location and content from all ecotopes utilized throughout the seasonal round of his prehistoric population. These conditions are rarely met. In most instances environmental data are collected for reasons other than modeling prehistoric human subsistence and the archaeologist extrapolates from those data. In the instance of the LAURD Cultural Resources Project, excavation of prehistoric materials was limited to those portions of the landscape that would be seriously damaged or destroyed by dam construction, inundation, or other related

activities. These areas probably represent only a segment of the territory utilized by the prehistoric inhabitants of the Canyon locality.

Fortunately, an increase in game studies by both state and federal agencies in response to increased recreation activities and a flurry of Corps sponsored environmental impact studies initiated in anticipation of Libby Dam construction resulted in a number of useful studies. Among the studies of particular application to the problem of carrying capacity for aboriginal subsistence practices are those of Zajanc (1948) and Blair (1955), which examine the modern population structures of game and to a lesser extent furbearing mammals, and May and Huston (1975 and 1979) and Graham (1979) that deal with the fisheries resource. Blair's study is of particular application because the LAURD project area falls within his study area. The size of his study area ( $3658 \text{ km}^2$ ) is sufficiently large to entirely encompass a reasonable daily range ( $\leq 25 \text{ k}$ ) for short term hunts or foraging missions undertaken by humans over the rough and broken terrain of the Canyon locality.

Two lines of inquiry span the extreme possibilities for analysis of prehistoric resource utilization. One approach would consider all the available resources, another would utilize only known (archaeologically or ethnographically documented) resources. Actual resource utilization over an annual period most probably lies somewhere between the two extremes. On the one hand people invariably avoid certain resources as too costly to secure (calories expended exceed calories acquired; this would include many of the smaller, more elusive, mammals such as bats, voles, shrews, mice, chipmunks, weasels and others), too dangerous (for example grizzly bear), too risky (resource not sufficiently dependable), undesirable because of cultural factors like taste, or they simply do not recognize the resource as having food value. On the other hand, seasonally specific sites or sites devoted to the acquisition of specific resources will not provide evidence of the annual resource utilization spectrum. Ultimately the decision was made to focus on the documented mammalian component because of the superior data base and because, with the exception of six fish vertebrae and a few pieces of mussel shell, mammalian remains comprised the entirety of the archaeologically recovered resources. Projections to include both fish and plant resources are included in the final calculation of carrying capacity.

#### PROCEDURES

To approximate the human carrying capacity of the mammalian component requires certain information: (1) species present (in this instance limited to archaeologically documented species), (2) population density of those species, (3) utilizable caloric content of an individual of each species, (4) proportion of a population that can be harvested without depletion of the resource, (5) human daily caloric requirements. From these data it is possible to calculate the number of persondays the available resources from a particular area may sustain over an annual period. The results of the calculations based on mammalian resources permit additional computation dependent

upon assumptions as to the portion of the actual diet contributed by other resources. If we assume that mammals represent 50% of the diet, fish 10% and plants the remaining 40% we can evaluate the necessary caloric contribution required by each component to sustain a particular human population size.

#### Species Present

The archaeologically documented indigenous food mammals appear in Table 4.1. These provide the data base for subsequent approximation of carrying capacity for total resource exploitation.

#### Population Density

Population densities used in the calculations are presented in Table 4.1. The area considered consists of approximately the same terrain included within the Kootenai Valley and Kootenai Canyon Localities (see Fig. 1.19) a total area of approximately 13,760 km<sup>2</sup>. Density figures for that area were achieved by extrapolating from maximum populations for Lincoln County provided by Blair (1955). Blair (1955) provides reasonably good information relative to game species (white-tailed deer, mule deer, wapiti, moose, mountain sheep, mountain goat, black bear, and grizzly bear) and fur bearers (beaver, mink, muskrat, otter, and marten). Fortunately, these species include the main constituents of the native diet as identified archaeologically and ethnographically (Turney-High 1941). With the exception of economically important species (game and fur bearers) density figures directly applicable to Lincoln County do not exist. Burt and Grossenheider provided the data for estimates of average animal weight (both sexes averaged into one figure).

#### Caloric Content

Estimates of utilizable meat yield and caloric content for different species have been made by several authors (White 1953, Stewart and Stahl 1977, Ziegler 1973). Many of these figures have come under scrutiny (cf. Lyman 1979) but few reasonable alternatives have been suggested. Particular problems involve the extent of processing involved and the extent to which internal organs are utilized. Rendering the bones for both marrow and bone grease and utilizing the internal organs produce far more calories per unit weight of animal than is gained by modern Euroamerican processes.

White (1953) calculated utilizable meat weight of an animal as a percentage of total weight (50 - 70% depending on family). His figures are based on butchering yields for modern domestic animals of several size categories. These data were then applied to wild species. Stewart and Stahl (1977) weighed the meat yield produced in the preparation of comparative skeletal material from fresh carcasses. Their figures probably represent a more accurate picture of meat yield than do those of White. Stewart and Stahl provided the basis for quantification of utilizable meat yield when applicable.

Table 4.1. Potential of Kootenai Region mammals to contribute to the aboriginal diet<sup>1</sup>.

Carnivore Name	Avg. Wt (kg)	Density <sup>2</sup> #/km <sup>2</sup>	Total in <sup>3</sup> study area	Percent Utilizable	Utilizable Wt. <sup>4</sup> (kg)	kcal/5, 6 individual	kcal at 20% harvest	Total kcal/ species
Black Bear	152000.0	.13	1788	.70	190328.3 (176179.8)	153216.0 (141834.0)	54814558 (50739800)	274072768 (253698900)
Snowshoe Hare	1350.0	61.5	846240	.50	571212.0 (464939.5)	1458.0 (1186.4)	246763582 (212784200)	1233817890 (1063920800)
Beaver	20250.0	.25	3440	.70	48762.0 (22424.0)	35154.0 (16170.8)	24185952 (1112300)	120929760 (55611500)
Bighorn Sheep	70300.0	.04	550	.50	19346.6	44289.0	4875333	24376664
Mule Deer	87200.0	1.0	13760	.50	599936.0	54936.0	151183872	755919328
White-tailed Deer	8200.0	1.9	26143	.50	1139878.4	54936.0	287249344	1436246720
Wapiti	315000.0	.12	1651	.50	260064.0	198450.0	65536126	327680608

<sup>1</sup>Mammals included are those whose remains appeared in archaeological excavations and the condition, context, and/or cultural modification of those remains suggest use as food sources. Population densities are based on estimates of modern productivity cycles and may not accurately represent prehistoric conditions.

<sup>2</sup>Density figures are derived principally from Blair (1955). Burt and Grossenbacher (1976), Banfield (1974), and the American Society of Mammalogists (1979) provided corroboration and/or additional information.

<sup>3</sup>Most of the Kootenai drainage system from Fort Steele, B. C. to Kootenai Falls (approx 13,760 km<sup>2</sup>).

<sup>4</sup>Utilizable meat weights based on recovery percentages of White (1953), those in parentheses are those of Stewart and Stahl (1977).

<sup>5</sup>Caloric content calculated from Adams (1975), caloric content of rodents based on cooked beaver meat, for all artiodactyla based on raw venison, for carnivores based on 100% lean beef, for rabbit based on domestic rabbit (cooked).

<sup>6</sup>A calorie (lower case c) is the amount of energy required to raise one gram of water one degree Celsius. A Calorie (upper case C) is equivalent to 1000 small calories or the amount of energy required to raise a liter (1000 cc, 1 kg, or 1000 grams) of water 1 degree Celsius. Thus, one Calorie is equivalent to one kilocalorie (kcal) or one thousand small calories. Because of considerable confusion in the literature we have chosen to utilize the abbreviation most consistent with standard metric nomenclature, ergo, 1 kcal = 1000 small calories.

The caloric values of meats were calculated from Adams (1975). Raw venison provided the base for artiodactyls, 100% lean beef for carnivores, cooked beaver for rodents, and cooked domestic rabbit for the lagomorphs. The product of estimated meat yield per animal multiplied by the caloric value per gram represents the average utilizable caloric content per animal of any order (Table 4.2).

Table 4.2. Caloric values per gram of meat for various mammalian orders (Adams 1975).

<u>Order</u>	<u>Derived from</u>	<u>kcal/gram</u>
Rodentia	cooked beaver meat	2.48
Carnivora	100% lean raw beef (flank steak)	1.44
Lagomorpha	cooked domestic rabbit	2.16
Artiodactyla	raw venison	1.26

#### Harvest Levels

The estimate of harvest level provides the baseline for calculation of the potential caloric contribution from each species. The harvestable quantity of all species represents the overall mammalian caloric contribution per year. Little information exists concerning the mortality levels of big game species in the study area. Lincoln County population estimates for deer between 1919 and 1954 (Blair 1955) show dramatic changes in population. In 1919 the total deer population was estimated at 16,500. The population showed an almost steady decrease until 1932 when the population was estimated at less than 5100 animals. By 1936, the population had increased to around 20,300. From 1936 to 1948 the population fluctuated between 14,000 and 20,500 at which time it began to increase to the final figure of 28,000 in 1954. Wapiti showed a similar though not contemporaneous change in population. From 1919-1926 estimates of the wapiti population ranged between 10 and 15 animals for all of Lincoln County. In 1927 the numbers began to increase and with minor fluctuations showed a steady increase to around 1,100 in 1954. Other game species such as moose, mountain sheep, black bear, and grizzly bear showed similar increases though not of the same magnitude as the wapiti. These dramatic population fluctuations were almost certainly affected by factors of modern timber harvest, forest fires, and human demographic trends. The extent to which similar factors affected prehistoric game populations remains speculative.

Obviously game herds are capable of marked reduction in population without eliminating their ability to rebound to previous levels in a relatively short period of time. Under ideal conditions whitetail deer recruitment can exceed 50% (Keene 1981:102). This implies that deer harvests could approach 50% of the population. In fact, to avoid extreme crashes in population due to overuse of browse during harsh winters predation should approximate recruitment. Both winter kill and predators will account for some animals. Human predation selects for different individuals than natural predators so little competition should exist between the two. We have chosen 20%

as a reasonable harvest level (maximum sustained yield) available to humans. This figure may be too low for many of the species utilized but provides a reference for comparison. It is likely that people dependent on a particular species will not take a particular percentage of the animals available, but will instead take approximately the same number year in and year out provided the animals are available. Under conditions of depletion such a practice might severely reduce the prey species' ability to rebound. Our figure of 20% annual harvest of the mean population seems reasonable in light of these considerations.

#### Non-mammalian Resources

Because of the paucity of data for non-mammalian resources the supplement of these resources to the mammalian constituent has been calculated as a percentage of the total diet (mammalian resources held as a constant). Lee and Devore (1968) presented percentage figures for dietary constituents (fishing, gathering, hunting) for the nearby Flathead Indians. From these figures it was possible to estimate the overall caloric content of the diet with various percentages of supplement to the mammalian resource (Table 4.3).

Table 4.3. Potential people/year represented by caloric availability of the total mammalian component and indicated percentages of plants and fish supplements @ 3000 kcal/person/day.

<u>PLANT</u>	<u>FISH</u>	0%	10%	20%	30%	40%	50%
0%	762	838	915	991	1067	1143	
10%	838	915	991	1067	1143	1220	
20%	915	991	1067	1143	1220	1296	
30%	991	1067	1143	1220	1296	1372	
40%	1067	1143	1220	1296	1372		
50%	1143	1220	1296	1372			
60%	1220	1296	1372				
70%	1296	1372					
80%	1372						

#### Daily Human Caloric Requirements

Human caloric requirements vary according to sex, weight, age, and activity. Robinson (1968:614-615) calculated a range of 2150-5350 kcal/day for males weighing from 65.5-80 kg (144-176 lbs) for all

activities from little or no exertion to extreme energy expenditure. For the same activity range nonlactating females from 50.5-62.0 kg (111-136 lbs) required 1750-4400 kcal/day. We have adopted an average figure of 3000 kcal/day as one in common use (Odum 1971:39). This figure is almost 50% higher than the average minimum of 2152 kcal/day adopted by Keene (1981:134) for temperate forest foragers.

#### Persondays

Calculation of persondays was achieved by dividing total available calories per resource group by the individual daily caloric requirement of 3000 kcal.

#### Human Population

Estimates of maximum human population are derived by dividing the number of persondays by period (in days) of presumed occupation (for a year-round occupation, 365 days). (If available information suggests a seasonal occupation the presumed length of the season would be utilized.) Estimates of human populations represented at excavated sites were calculated on the basis of recovered remains. By estimating total site volume subsequent calculations of caloric content were performed and persondays derived.

#### RESULTS

Estimates of caloric availability with a human predator rate of 20% are presented in Table 4.1 for mammalian species with archaeologically documented utilization. The number of people supportable per annum through use of documented mammalian resources and various percentages of supplemental resources appears in Table 4.3.

By any measure, the amount of biomass (and calories) available in presumably non-utilized mammalian species far exceeds that of those for which we have relatively reliable indicators of use. For example, the total utilizable kcal available from species listed in Table 4.1 is  $8.3460 \times 10^8$ . Calculation of the utilizable caloric potential available from Columbian ground squirrels with an average density of  $419/\text{km}^2$  (Banfield 1974:118) and a 20%/annum harvest indicates a potential of  $11.5301 \times 10^8$  kcal, nearly half again that of the mammals of documented human use. The abundance of small rodents and lagomorphs causes a considerable discrepancy between the total mammalian resource and the documented mammalian resource caloric potential. Although density of these species is high, intensive, systematic exploitation would probably prove counterproductive. Taking rodents or rabbits on an encounter basis when engaged in hunting species with a higher yield/energy output, by trapping as an auxiliary food source, or by apprentice child hunters is essentially a no-cost approach. None of these alternatives will reliably produce a high yield. Although artiodactyla require a greater energy expenditure to capture, retrieve, and process, the energy return frequently exceeds that of smaller, more elusive game. While the

total calories available from the archaeologically documented more popular species is substantially lower than that of the total mammalian resource base, they are capable of supporting a substantial human population (Table 4.4). The use of supplemental resources (fish and plants) would add significantly to the size of the potential human population.

Table 4.4. Human population potential of the archaeologically documented mammalian resources for various lengths of occupation (@ 3000 kcal/person/day and 20% harvest level).

<u>Occupation</u>	No. supported by documented mammalian resource <u>(8.3460 x 10<sup>8</sup> kcal)</u>
Full year	762
All but winter (245 days)	1136
Short winter (90 days)	3091
Long winter (120 days)	2318

Calculations for the numbers of individuals potentially supported at each of the excavated archaeological sites that contained sufficient faunal remains for evaluation are presented in Table 4.5. Results were achieved by calculating frequency by volume and converted to total site volume. The presence of multiple components at each site is problematical. Because components were mixed (both horizontally and vertically) it is impossible to assign quantities of faunal remains to particular occupations. The figures in Table 4.5 represent a composite of all components. Use of other resources not represented in the preserved fraction from the sites (fish and plants) would increase the potential population size.

#### DISCUSSION

Throughout the archaeological survey, testing, and salvage efforts in the LAURD project area deer remains have dominated the faunal assemblage. Without exception, at every site that contains identifiable bone deer prevail to the virtual exclusion of other species.

Plant remains other than seeds are infrequently preserved in archaeological contexts. Despite extensive efforts to recover plant remains with water screens and fine mesh sieves, none were recovered that might not represent modern intrusion (occasional wild onion seeds). Implements such as grinding stones and mortars or roasting pits analogous to those used ethnographically frequently provide the only inferential indication of plant usage in archaeological contexts. Nothing that resembled a roasting pit was found in the 1979 LAURD salvage excavations, no mortars or metate-like implements occurred, and possible grinding stones appeared infrequently. In no instance was the wear indicative of unequivocal use for plant processing.

During the 1979 LAURD excavations a total of six fish bones were recovered from four sites (24LN10, 24LN528, 24LN1020 contained one bone each, 24LN1125 produced three), and single elements were recovered during the University of Idaho testing and salvage at 24LN1036, 24LN1050, and 24LN1043. Another possible indication of fishing activity is the presence of bilaterally notched pebbles (net sinkers?) at all 1979 sites adjacent to the river. While archaeological evidence documents the use of fish it does not support their use as a staple resource.

The emphasis on deer to the virtual exclusion of most other mammalian resources (in particular elk, moose, and sheep) seems indicative of a specific utilization of the LAURD area. Indicators of seasonality available at this time suggest seasonal occupation correlative to times of deer aggregation within the river valleys. Examination of deer behavior indicates that hunting strategies organized for optimal exploitation (maximum caloric return for energy expended) would stress a seasonal use cycle. This is not meant to imply that deer were taken only during a particular season, but that heaviest use in the immediate LAURD area probably took place during late fall-winter.

Table 4.5. Potential human population supportable from sites excavated in 1979 LAURD project.

Percent of site area excavated.

<u>Site</u>	<u>Total Area (m<sup>2</sup>)</u>	<u>Area Excavated (m<sup>2</sup>)</u>	<u>% Excavated</u>
24LN1125	26900	484	1.2
24LN1029	2100	40	1.8
24LN528	36200	287	0.7
24LN10	14100	46	0.3

Estimated # of person days at each site represented by faunal remains for excavated remains and estimated total site remains.

<u>Site</u>	<u>Excavated Persondays</u>	<u>Estimated Persondays</u>
24LN1125	387.1	20373
24LN1029	37.0	1948
24LN528	471.2	67314
24LN10	344.3	114766

Number of people supportable by estimated total site faunal resource.

<u>Site</u>	<u>All Year</u>	<u>All but Winter</u>	<u>Short Winter</u>	<u>Long Winter</u>
24LN1125	55.8	83.2	226.4	169.8
24LN1029	5.3	8.0	21.6	16.2
24LN528	184.4	274.8	747.9	561.0
24LN10	314.4	468.4	1275.2	956.4

## RESOURCE UTILIZATION STRATEGIES

### A Consideration of the Resource Base

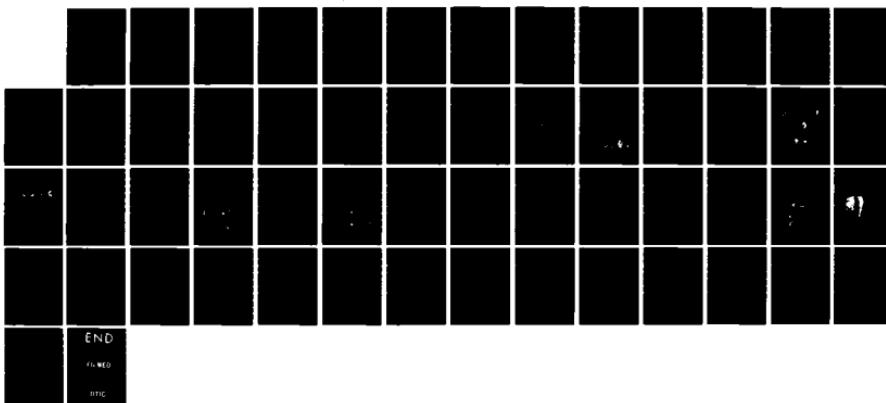
Subsistence items available to the peoples who occupied the LAURD project area in particular and the Barrier Falls subarea in general contrast prominently with those of the surrounding territory (Fig. 4.1). To the west in the Columbia Plateaus, two resources stand out as staples--the salmon of the rivers and the camas from the meadows. Both items figured prominently in the diet and native subsistence activities revolved around these two staples. Prominent supplements to the diet consisted of deer and antelope, and at intervals in the past bison contributed to the diet (Schroedl 1973). Across the Rocky Mountains to the Plains, bison provided the staple resource for a substantial human population. Again additional resources, both animal and plant, supplemented the staple. To the north, in the Western Subarctic, caribou, with their predictable migratory behavior, provided a relatively reliable, although seasonal, food source.

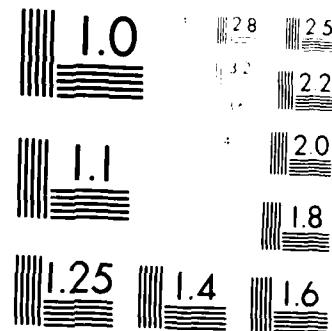
With the exception of salmon, most of these resources probably appeared as indigenous elements within the Barrier Falls subarea, but not with the reliability or abundance that they occurred elsewhere. Within the Barrier Falls subarea most of these same resources occurred infrequently if at all. Camas (Camassia quamash) provides a possible exception to the above statement in some parts of the Barrier Falls subarea. Camas is distributed throughout the states of Oregon, Washington, Idaho, and western Montana. It also occurs in both British Columbia and Alberta (Gould 1942). It has been argued that because of locality specific spatio-temporal distributions, plant foods (presumably camas in particular) represented the most important variable in determination of local population aggregation among the Nez Perce (Ames and Marshall 1980:34). Presumably plant foods had a similar effect on other plateau groups as well but exogenous variables may have altered the impact.

Camas appears in relative abundance in the moist meadows of eastern Washington and throughout the lower lying elevations of the Idaho panhandle. Weippe Prairie, in Clearwater County, Idaho, represents a particularly well known camas collecting ground, and other centers of aboriginal camas collecting activity are well distributed in this territory. In western Montana camas collecting grounds are less abundant. Areas of relative abundance are the Camas Hot Springs area (the Little Bitterroot valley) of Sanders County and the northern Bitterroot and tributary valleys in Ravalli and Missoula Counties. East of the continental divide the valley of the Big Hole River contains camas gathering areas identified by Lewis and Clark (Thwaites 1959v:250-251).

Even the casual observer will note occasional patches of camas scattered over much of the northwestern United States. The frequency of occurrence increases west of the continental divide and attains its peak in the moist meadows of the western Idaho panhandle, eastern Washington, and northeastern Oregon. Areas of abundance elsewhere in

RD-A151 998 KOOTENAI CANYON ARCHAEOLOGY THE 1979 LAIRD (LIBBY  
ADDITIONAL UNITS AND REREGULATING DAM) PROJECT(U)  
MONTANA STATE UNIV BOZEMAN DEPT OF SOCIOLOGY T E ROLL  
UNCLASSIFIED 1982 DACW67-79-C-0072 2/2  
F/G 5/6 NL





MICROCOPY RESOLUTION TEST CHART  
Mfg. by Micro-Vue Co., Inc., New York, N.Y.

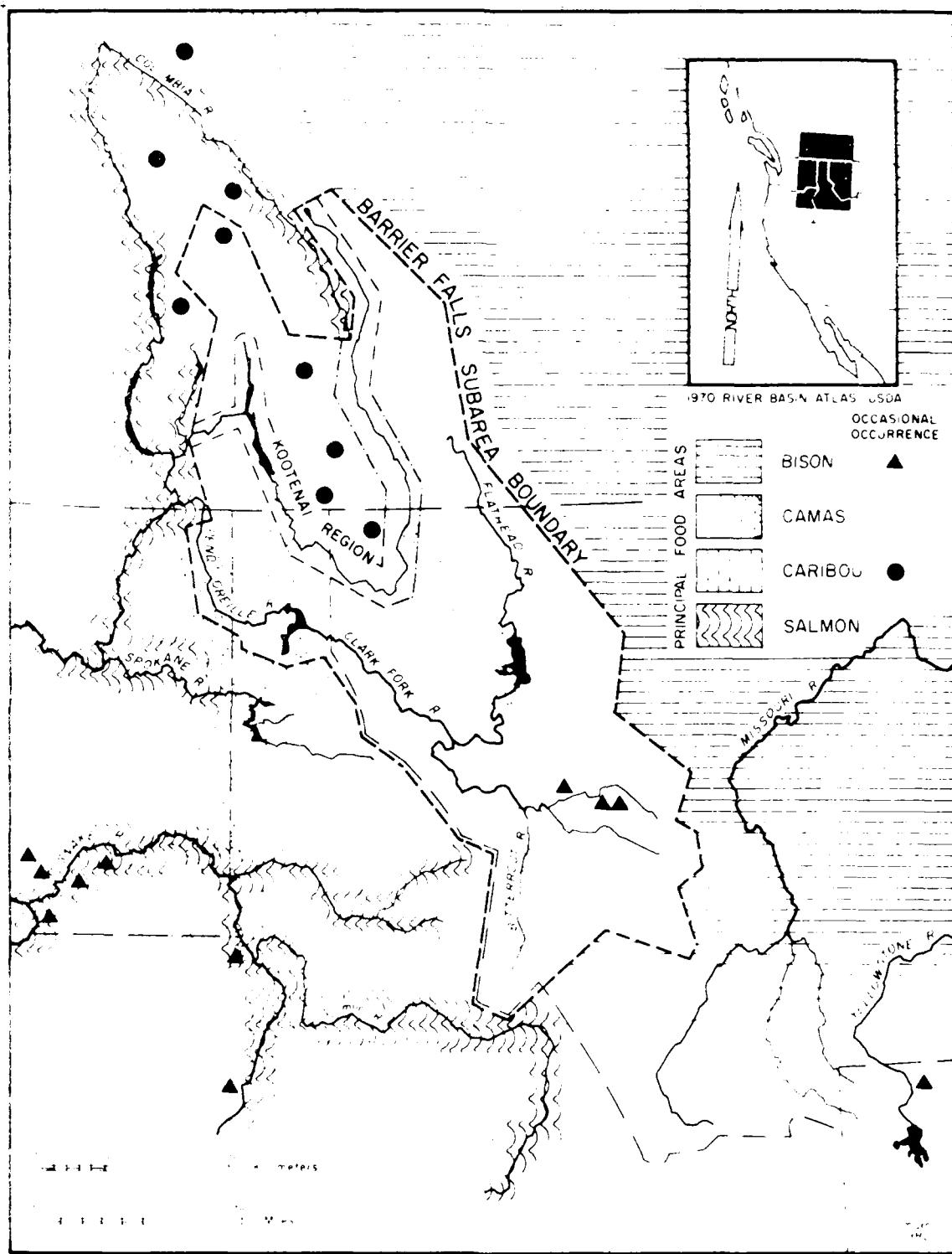


Figure 4.1. Distribution of prominent food resources of the northern transmontane west.

these states associate with well-watered meadow-like terrain. The Barrier Falls subarea contains several regions that offer opportunity to exploit camas. The region of our concern, the Kootenai Region, is not well known for concentrations of camas. Small patches exist in moist localities around the Tobacco Plains, in Pleasant Valley (about 60 km SE of Jennings), and in the valley where present-day Libby is located (Hart 1976:14-18). Somewhat more dense concentrations appear in appropriate locations in the lower Kootenai valley where the river flows northward through the Purcell Trench.

The proclivity of Euroamerican agriculturalists to settle open meadows and prairies and to then expand the available arable land by draining moist areas has dramatically affected our ability to define areas of aboriginal camas distribution and to assess the productivity of those areas. While aboriginal exploitation may increase camas productivity, Euroamerican agricultural practices have virtually eliminated many camas beds. With some exceptions, camas appears today within the Kootenai Region in thinly scattered patches that rarely offer quantities sufficient to provide an aboriginal subsistence staple. The nature of historic disturbance and absence of reliable distributional studies make it difficult to assess the prehistoric significance of camas in the Kootenai Region.

It seems apparent that the staple foods of surrounding regions did not suffice as staples to all of the people of the Kootenai Region. To postulate use of these particular resources we are faced with the problem of having our people moving at a virtual lope from the salmon run at Kettle Falls on the Columbia River in Washington or in Columbia Lake at the headwaters to the camas grounds near Cusic, Washington, or at Camas Hot Springs in Montana, thence eastward across the Rocky Mountains to hunt bison, then back to the homeland to rest.

Like many other aspects of Turney-High's Kutenai ethnography his seasonal round leaves a bit to be desired. Critical scrutiny reveals some inconsistencies that are difficult to resolve. We find (Turney-High 1941:53) that "Early in the spring the Kutenai went to their fishing grounds. As the spring advanced into early May, the fishing season came to a close and the women entered the root gathering season." The root gathering season agrees with other sources and the seasonality of both bitterroot and camas is correct. The timing of the fishing season presents some difficulties. If we assume that the fishing season coincides with the time of greatest fish availability we must assume that the prey species were the western cutthroat, rainbow and/or the two species of suckers. The cutthroat and rainbow are unlikely prospects as they represent <3% of the fish biomass in the Kootenai and the rainbow are an introduced species above Kootenai Falls (May and Huston 1979:40). Suckers begin their spawn when the water temperature reaches 10° C (50° F), usually in late April or early May (May and Huston 1979:39). Whitefish, about equal in abundance to the suckers in the Kootenai drainage, spawn in the autumn (May and Huston 1979:25). In the Northern Plateau Area, but outside the Barrier Falls subarea, the anadromous salmon represent the most abundant species. Salmon reach Kettle Falls in two waves, the first in late June, the second in August (Bryant and Parkhurst 1950). The seasonal round as described by Turney-High is incorrect and/or fish

did not play as prominent a role in Kutenai subsistence as one might suspect.

In addition to the problems discussed above the extensive movement of people that Turney-High describes would involve some serious logistical difficulties. Using straight line measurements from Jennings, Montana, to Kettle Falls to Camas Hot Springs, to Heart Butte on the Montana plains and then back to Jennings, the people would traverse 750 km (470 mi) in a relatively short five to six months if we have read Turney-High (1941:53-55) correctly. With the arrival of the horse it might be plausible, but such movement for pedestrian foragers seems improbable. The expenditure of energy involved in moving goods and food such distances would likely exceed the energy captured; it would certainly leave little reserve.

More appropriately, we should first examine the potential of a more limited territory to provide the necessities of life before we postulate extensive movement over vast areas. Special task groups undoubtedly will venture into new or hostile territory, but the contribution of their activities to group subsistence will rarely equal that of the homebody who exploits familiar terrain. The Canyon locality supports an array of plant and animal resources capable of sustaining humans. The basic questions revolve around the nature of the resource, abundance, distribution, and the manner and extent of human utilization. The final question asks the size of the human population that the resources actually supported with the technology employed in a locality at a time in the prehistoric past. This question will remain unanswered, for it is unanswerable at this time for any prehistoric population. We can make comparisons to nearby localities or regions as to resource availability and probable extent of use. From these comparisons we can make relative statements about population densities (greater than, less than, about the same as). The accuracy of the statements is in large part controlled by the data acquired from modern resource distributional studies and ethnographies.

#### Economically Significant Plants

##### Bitterroot

Turney-High indicates that bitterroot (*Lewisia rediviva*) was the most economically significant plant to the ethnographic Kutenai. He states that each woman "should gather at least the equivalent of two grain sacks per season [Turney-High 1941:33]." Recent work on bitterroot provides some useful data (Aaberg 1981). Recently harvested (wet) bitterroot collected near Townsend, Montana, weighed an average of 10.5 g per root with a volume of 17.7 cc. This results in 2055 roots with a total weight of 21.5 kg per bushel (about 60% less in weight but approximately the same volume when dried). Calorimetry performed at Montana State University by Clayton B. Marlow indicated an average gross energy (compared to utilizable energy as used in calculation of mammalian caloric content) content of 2.42 kcal per gram (dried to 40% moisture content). If we assume the grain sacks used to collect bitterroot contained about one bushel each, the

average family would have available about 52,000 kcal of bitterroot. Because bitterroot is readily collected only during the spring when it is in blossom, the quantity collected would represent the amount utilized over a year. Using our average caloric expenditure of 3000 kcal/person/day, the two bushels of bitterroot would yield about 17 persondays caloric requirement, three days for a family of five (less, considering the fact that the figures represent gross caloric content rather than digestible content).

While this does not seem to represent much of a contribution to the food requirement of the family, the quantity is not surprising when examined in further detail. Murray (1929) recorded that among the Flathead and Kutenai,

Only small portions of Bitterroot were prepared for eating at one time . . . Bitterroot was not eaten every day. It was carried on trips because it was light and nutritious.

According to Palmer (1871) one ounce (28 g or about 68 kcal) was considered adequate for a meal and two to three ounces (presumably dried) could satisfy a fatigued man. (This statement seems doubtful given our assumption of 3000 kcal/person/day.) If these estimates are correct and the collected bitterroot was not used at every meal then the "two grain sacks" per family might represent an annual supply though we might hope they contained a somewhat larger quantity than we have identified.

#### Serviceberry, Huckleberry, and Chokecherry

Three sources of berries receive mention as being of importance to the ethnographic Kutenai: serviceberry (Amelanchier alnifolia), huckleberry (Vaccinium globulare), and chokecherry (Prunus Virginiana) (Turney-High 1941:34). That berries figured in the subsistence of the Kutenai is further documented by their names for the "moons" or months of the year as recorded by Claude Schaeffer (1936:IV-69):

Sixth, Kvkvkúpku - period when strawberries ripen, June.  
Seventh, kukusqvm<sup>u</sup> - period when service berries ripen, July.  
Eighth, GitsilimidíhiGówai - berries ripen overnight, August.  
Ninth, GułmaGákGu - period when chokecherries are really ripe, September.

July is usually considered the prime month for collection of serviceberries. In lower elevations huckleberries ripen by late July, but by mid-August even those at higher elevations are ready to harvest. Chokecherries ripen by late August or early September but attain their sweetest character after the first hard frost (anyone raised in areas of chokecherry abundance can attest to the change that occurs in the chokecherry after a frost).

Beyond acknowledging that berries were collected and eaten and that they probably added significant vitamins and other essential nutrients to the prehistoric diet, little can be said about their contribution to subsistence. Berry patches seem to proliferate in

burned forests and often represent a seral stage in reforestation. The quantities of berries available can fluctuate dramatically. During some summers the huckleberry yield is infinitesimal, in others it is prolific. These fluctuations could probably have been dampened by deliberate burning to maintain large areas suitable for berry growth and production. (The idea of deliberate aboriginal burning as a significant force in prehistoric forest ecology has begun to receive considerable favor [cf. Barrett 1981].)

#### Black Moss (Black Tree Lichen)

The black tree lichen (*Alectoria fremontii*), locally referred to as black moss or Spanish moss, accumulates heavily in coniferous forests of western Montana. In the Kootenai region it seems to have a particular affinity for lodgepole pine (*Pinus contorta*). The first description of Kootenai Falls is immediately followed by a brief description of the use of black tree lichen as food. David Thompson and his party of explorers were obviously hungry, as they had just deprived a carrion-eating eagle of his dinner. This repast of spoiled deer meat had made all who partook ill (Tyrrell 1916:388).

The next day we came to ten Lodges of Kootenae and Lake Indians. They had nothing to give us but a few dried Carp and some Moss bread, this is made of a fine black moss, found on the west side of the Mountains attached to the bark of a resinous rough barked Fir and also to the larch. It is about six inches in length, nearly as fine as the hair of the head; it is washed, beaten, and then baked, when it becomes a cake of black bread, of a slightly bitter taste, but acceptable to the hungry and in hard times, of great service to the indians. I never could relish it, it has just enough nourishment to keep a person alive.

No figures have been located on the caloric or nutritional value of black tree lichen. To the discriminating palate it must not be as bad as Thompson indicates, as modern Nez Perce serve it with sugar and cream and the Flathead reportedly viewed it as a luxury item (Hart 1976:11).

Two roots, bitterroot and camas; three fruits, serviceberry, huckleberry, and chokecherry; and black tree lichen stand out as plant resources as documented by the ethnographic record. Other resources are recorded but neither as frequently nor with such regularity. Certainly many other resources exist in the Kootenai region but their significance to the native food quest is doubtful. Surprisingly, the only plant food mentioned by Thompson during his journeys on the Kootenai River is the black tree lichen. What has been identified as camas first appears in his journal while visiting near modern Cusick, Washington, in September 1809 (Tyrrell 1916:413). That plant foods played an important role in prehistoric subsistence is unquestioned. The nature of the contribution is undetermined. For the present we will argue that there was no staple plant food but, like other resources discussed later, plants filled a critical need during certain seasons.

## Animal Resources

### Fish

Thirteen fish are native to the Kootenai River: western cutthroat trout (Salmo clarki lewisi), rainbow trout (Salmo gairdneri), Dolly Varden (Salvelinus malma), mountain whitefish (Prosopium williamsoni), white sturgeon (Acipenser transmontanus), burbot (Lota lota), largescale suckers (Catostomus macrocheilus), longnose suckers (C. catostomus), torrent sculpin (Cottus rhotheus), slimy sculpin (C. cognatus), redside shiner (Richardsonius balteatus), northern squawfish (Ptychocheilus oregonensis), peamouth chub (Mylocheilus caurinus), and longnose dace (Rhinichthys cataractae). Only the trout, Dolly Varden, whitefish, squawfish, suckers, burbot, and sturgeon are large enough and easy enough to catch to offer a reasonable food source. Of these, only the whitefish and largescale suckers occur in sufficient abundance to offer the possibility of a reasonable fishery for aboriginal subsistence purposes. These two species account for 93% of the fish captured by electrofishing in 1971 downstream from Kootenai Falls. A short distance downstream from Libby, Montana, whitefish populations per 1000 feet of river ranged from 165 in 1974 to 710.8 in 1978; equivalent weights ranged from 87.5 to 548.3 lbs. The average weight per whitefish then ranged from .53 to .77 lb (240-350 g) (May and Huston 1979:35). In general the number of suckers was somewhat less than whitefish but they were also somewhat larger (16.4 compared to 12.3 in). We may assume that the biomass for the two species is about equal. If we take the highest figure recorded the total biomass of the Kootenai for these two prevalent species is about 1100 lbs/1000 ft (1640 kg/km). If native fishermen were to totally deplete the 32 km (20 mi) of river upstream from Kootenai Falls of its whitefish and sucker resource it would yield about 52,480 kg (115,456 lbs). Compared to the theoretical annual anadromous fish catch at Kettle Falls of 1,960,000 lbs (>890,000 kg) (Chance and others 1977:13) the fish biomass of the Kootenai pales.

In 1978, a particularly good whitefish year, an estimated whitefish population of 21,812 fish with an average weight of 350 g (.77 lb) ascended the Fisher River on their spawning run. The peak of the run was 18 October to 15 November (May and Huston 1979:27). This run would produce a total of 7,634 kg (16,800 lbs). Between 1973 and 1978 the whitefish population per 1000 ft increased by almost five times in some sections of the Kootenai. From these figures it seems probable that about 25% of the population could be taken annually without depleting the resource. From the Fisher River whitefish run this represents about 1900 kg (4200 lbs). At 2000 kcal/kg for fish flesh and viscera this would produce 3,800,000 kcal or 1266 persondays. If we double the figure to include a similar catch of suckers, trout, and other fish we have 2532 persondays of fish subsistence. Fish alone, from that location, would support seven people for one year at 3000 kcal/person/day.

Silt load of the river, water temperature, disease, and many other factors influence the productivity of a river at any point in time. Borde and Bush (1975) recorded a substantial increase in the

number of trout available in the early 1940's, an event apparently associated with a change in water quality as the bottom of the river became slippery with "moss" at the same time.

Other similar changes must have occurred during the past. Events like the warming trend documented in our palynological records (see Chapt. 3) undoubtedly had a significant impact on water quality; the quality of aboriginal fishing would fluctuate accordingly. Apparently David Thompson arrived in the Kootenai at a low ebb in fish productivity. Time and again in his journal while on the Kootenai we find "-/as to fishing we have often angled, but never/once had a bite./" (White 1950:19), "fished at the foot of/the Falls - but nothing as usual." (White 1950:23).

Like plant foods, fish taken from within the system of the Canyon locality probably did not serve as a staple resource. Use of this resource might have filled out the larder and provided the critical nutrition necessary for survival until another resource became more abundant or could be acquired.

#### Birds

Birds are dismissed as a significant resource for Canyon locality residents because of the low density of migratory fowl. It is recognized that resident birds such as the various grouse were probably utilized on an encounter basis. Their contribution to the annual diet would appear minimal.

#### Mammals

Populations of large mammals have exhibited large-scale fluctuations in estimated numbers during the 20th century (Blair 1955:10-11). The all-time recorded low for deer occurred in 1934 when the estimated population was 5,525. By 1954 the estimated population of both species had increased by about five times to an estimated 28,000. White-tailed deer (Odocoileus virginianus) typically outnumber the mule deer (O. hemionus) in Lincoln County, but in different years estimated ratios have ranged from 1:1 to 1.8:1 white-tailed to mule (Blair 1955:10).

Wapiti (Cervus elaphus) have not been an abundant animal during the time that records are available. From an estimated low of ten animals in 1923 they had attained a population of around 1100 by 1953. Moose (Alces alces) are typically even more rare, with estimates of the population ranging from one in 1925-1927 to a recorded high of 510 for all of Lincoln County in 1952. Mountain sheep (Ovis canadensis) demonstrate somewhat less fluctuation in numbers, but the populations have remained relatively low (30 in 1919-1921 to 400 in 1953). Mountain goat (Oreamnos americanus) numbers ranged from 40 in 1924 to 220 in 1948. Estimates of black bears (Ursus americanus) show an increase from 370 in 1920 to 1,205 in 1948. Grizzly bears (Ursus arctos) maintain a low population with extremes of 30 in 1920 and 83 in 1948 (Blair 1955:10-11).

Population estimates for small mammals are restricted to

potential economic species. In 1948 estimated populations were as follows: beaver (Castor canadensis), 2,365; mink (Mustela vison), 1,180; muskrat (Ondatra zibethicus), 4,575; otter (Lutra canadensis), 50; and marten (Martes americana), 1,200 (Blair 1955:12). Populations and densities of other small mammals of potential economic significance to prehistoric people such as rabbits and ground squirrels are unquestionably greater than for any of the fur-bearers. Unfortunately, estimates of populations for these animals are unavailable.

Of the animals discussed above, only deer and wapiti occur in sufficient abundance and density to contribute substantially to the aboriginal resource base. As the archaeological data base indicates, most of these animals were taken and almost certainly used as food. Deer occur far more frequently in the archaeological record than the others.

## HUNTING STRATEGIES

### Deer hunting

Full exploitation of big game populations requires a thorough knowledge of game behavior patterns. Returns from any adopted strategy, whether ambush, drives, surround, or single encounter, will be greatest if daily and seasonal patterns of movement are understood. Knowledge of escape or concealment behavior will also enhance the hunter's success. Because of limited access along the valley and at river crossings, the deer in Lincoln County follow relatively specific routes during seasonal movements. The same factors contribute to similar specificity of behavior on a daily basis during the winter months. Due to heavy snows and limited forage winter deer ranges are restricted in distribution. During downward (late fall-early winter) migration deer usually follow a limited number of well traveled routes. Winter ranges are restricted to the river valley bottoms, level areas along parts of the Fisher River drainage, and relatively open south facing slopes. Movement to these areas frequently results in the deer crossing the Kootenai River at specific locations. Typically, these crossings occur at fords where the river is fairly shallow although they may cross at any point along the river. (The Jennings-Slaussen Terrace is an example of such a location.)

Once animals have moved to the valley bottoms, up or downriver movement is necessary if the animals are to cross at one of the favored fords. These trails and fords offer good locations for hunter success. By coordinating the efforts of several hunters animals moving along the river bottom could be driven into the river where the animals' mobility would be limited and therefore they would be more easily dispatched. Ambush of deer along defined trails would also increase either individual or communal hunting efficiency.

During the winter, mobility of both deer and wapiti is at its lowest while aggregation and therefore effective density of both species attain its highest levels. As high as 53 deer per  $\text{km}^2$  (!<sup>35</sup>)

/mi<sup>2</sup>) have been recorded in the Wolf Creek-Fisher River winter ranges for white-tailed deer (Schmautz and Zajane 1949). Heavy snows frequently place severe restraints on deer mobility and the aggregated deer populations become easy prey to both human and other predators. With a bit of cultural baggage such as snowshoes the human predator becomes even more effective.

During the winter and early spring lightly wooded south facing slopes are the first areas cleared of snow. During intervals of grass exposure small groups of deer commonly appear moving along these slopes. Although deer mobility is greater than when they are congregated in the parks various strategies could be employed to successfully take deer under these conditions. Communal driving practices with hunters staked out at predicted interception points is one of several possibilities. Knowledge of prey behavior would again enhance the possibility of success.

During the period of outward dispersal to summer ranges the migration routes would again offer good locations for ambush. Later in the spring and throughout summer and early fall deer and elk are widely dispersed over their ranges. The effective density of game is dramatically diminished during the warm months and hunting would probably be limited to ambush and encounter strategies that yielded one or two animals at a time. Occasional communal hunts could be undertaken but the success of such hunts would be substantially less than during the late fall or winter.

Late fall to early spring affords the best time of year to exploit both deer and wapiti resources for maximum yield with minimum effort (wapiti less so than deer both because of smaller numbers and because they tend to favor more remote habitat). During this time deer are concentrated along their migration "funnels" or congregated on winter range where their mobility is limited by snow.

#### Compatibility with the Archaeological Record

Examination of archaeologically recovered faunal remains reveals an emphasis on exploitation of certain animals. At all sites excavated between 1977 and 1979 that produced identifiable faunal remains deer comprised >90% of the faunal assemblage. The limited information available on seasonality indicates late fall to early spring occupation.

The extremely scanty evidence available consists of deer skull fragments that have pedicels from which the antler has been shed and not yet replaced, or that still bear the antler but show erosion around the base of the antler indicative of the impending loss. Such remains were recovered by the U of I testing and salvage at 24LN1024, 24LN1030, 24LN1032, 24LN1037, and 24LN1046. In 1979, 24LN10 and 24LN528 produced similar evidence of late fall-early spring habitation. Both 24LN528 and 24LN1046 yielded skull fragments with fully developed antlers still attached (but eroded). This places the time of death at early fall-winter. These are the only potential indicators of early fall occupation and they may indicate a kill event

only somewhat earlier than the rest. As yet no examples of partially developed antlers, indicative of a late spring-summer season, have been found.

#### CONCLUSIONS

Resource availability within the Canyon locality decreases dramatically during the late spring-summer months when deer almost abandon the valley bottoms, fish runs are either completed (trout) or have not begun (whitefish) and the limited vegetal crops have not yet reached maturity. A small group of people could subsist in the Canyon locality over an annual period on the available resources. With a larger population the limited resources of the summer would encourage dispersion to higher life zones.

The apparent single source emphasis would present certain dangers to a comparatively large group of people if they occupied the Canyon locality on a year-round basis. The human population must reflect to some extent extreme fluctuations in the base or staple resource. A hard winter that severely depleted deer populations would inevitably result in a lower potential harvest the next year. Total loss of the harvestable portion of the resource would eliminate 50% of the calculated calories available from animals. Human responses might be to emigrate or starve (an unlikely prospect). Other responses might involve technological change (more effective equipment or development of a new resource base), expansion of the seasonal round to include more territory, or trade with outsiders. Use of nonlocal resources and storage of local plant, fish, and mammalian foodstuffs during times of seasonal abundance would carry frugal people through a lean period. Several in a row might result in dramatic alterations in either the population or their subsistence strategy. Despite these potential supplemental resources, a fixed or central base adaptation focused on deer does not seem to approximate the prehistoric subsistence strategy. A major catastrophe to the deer population would have left the human occupants with a varied but thinly and widely distributed, comparatively scarce resource base.

The most reasonable subsistence regime appears to be one in which the people practiced a seasonal round that called for relative aggregation of populations in the river bottoms during late fall-early spring and population dispersion throughout the rest of the year. The narrowly defined seasonality recovered from archaeological work and the almost monotypic species use seems to support such a subsistence system.

In all probability the seasonal distribution patterns of human occupants in Lincoln County are not too different today from what they were throughout the period of prehistoric habitation. The major industries in Lincoln County today are lumbering and mining. Once winter sets in the lumberjacks and many of the miners move out of the mountains and settle in the towns of Eureka, Libby, or Troy. The heavy snowfall prohibits movement throughout most of the backcountry.

With the onset of spring (or even the hint of spring) the "cabin crazies" begin to disperse toward the high country. Throughout late spring, summer and fall, the modern population of Lincoln County is dispersed throughout the hills. As winter approaches the townward migration begins again. Employment records reflect the seasonal nature of employment in Lincoln County. Employment increases begin in May and reach a high in October (only 9.8% unemployment in 1980) at which time available employment drops back and by January a substantial portion of the population is unemployed and remains so until employment increases again in late spring (14.2% in January 1980 with maximum unemployment in April 1980 of 26.5%) (State of Montana Dept. of Labor and Industry 1981).

#### SUMMARY

Lincoln County is and has been capable of supporting a relatively large human population over an annual period. Table 4.4 indicates that just the mammalian resources of archaeologically documented use would annually support at least 700 people interminably. Examination of the archaeological evidence fails to reveal stable, long term occupation within the ten mile stretch of the Canyon locality occupied by the LAURD project area. The material recovered seems indicative of numerous short term occupations on available land surfaces. Some of these occupations have been interpreted as the result of specialized activities (24LN1036)(Henry 1979), but most contain implements indicative of a spectrum of day to day activities.

Archaeological faunal assemblages suggest a specialized use of the area's animal resources with deer as the primary prey species. Indicators of seasonality encourage the speculation that the principal habitation of the locality took place from late fall to early spring. A number of seasonally specific events occur at this time of year: 1) ungulates congregate in the river valley and adjacent lowlands, 2) these congregated animals become easy prey because of limited mobility due to heavy snowfall, 3) other animal resources decrease in abundance due to hibernation (bears, marmots, ground squirrels, etc.), migration (waterfowl), or dispersion (fish), 4) productivity of plants either ceases or declines dramatically. The natural history of the area coupled with archaeologically recovered subsistence items (both faunal and technological) leads to the conclusion that the prehistoric people who occupied these sites focused on a specific resource (deer) at a specific season (late fall to early spring.) The relative abundance and ease of acquisition explain the choice of prey and season. Evidence for the remainder of the subsistence quest both in terms of resource and season is not obviously documented in the sites of the LAURD project area. Either the information has not been preserved or we will have to look to sites elsewhere in the Kootenai region to uncover the rest of the subsistence round. A likely prospect is to look to higher elevations and to expect sites of even less prominence and density than those of the LAURD project.

## 5. A PROVISIONAL CULTURE-HISTORICAL OUTLINE

5

### KOOTENAI REGION PREHISTORY

By

Tom E. REED

#### INTRODUCTION

A culture-historical outline patently violates certain of the canons of the "new" archaeology and labels this as an outmoded approach, doomed before it begins. On the other side, the relative paucity of data, in particular the absence of stratigraphic control and uncertain affiliation of artifacts with one another and their "radiocarbon" radiocarbon dates, limits the kind of arguments that can be brought to bear on the problem. Regardless of these constraints I shall proceed to present a provisional statement of my views of prehistoric developments within the Kootenai Region as they have been partitioned by archaeological salvage efforts on the LAURD project.

Archaeology must hope to achieve more than "mere" culture history or the chain of cultural events in a small portion of the prehistoric world. We hope ultimately to develop causal links that allow us to explain the processes involved in the evolution of particular human adaptations and, in a broader sense, the evolution of culture in general. Since Walter Taylor's A Study of Archeology (1948) abundant ink (and some blood) has been spilled in discussing the appropriate subject for archaeological inquiry. I do not intend to expand on the topic beyond stating that inquiry into process seems to progress most successfully in those areas where there are precise chronological controls and developed cultural-historical syntheses.

Without a solid chronological framework established on the basis of causally derived data the tools, implements, facilities, and places utilized by prehistoric people cannot truly be placed in a processual context. Archaeology is essentially a diachronic discipline. In the nature of culture change and adaptation we must have some notion of the order of events to determine the human response. The calendar date of particular events has little significance to the archaeologist, but the order of change, "cultural time" (Chang 1967), is critical. We must have some gross idea of time to make even the determination that no change has taken place. In order to validate "functional" types or evaluate seasonal specialization, time must receive consideration and be controlled for. We know that there has been substantial environmental change over the last 12,000 years. We also need to know how humans have responded to these changes.

in riverine resources. This situation remained until the mid-second millennium, clear water of the Kavalla River seems to be an important factor that controls the fish biomass at relatively unproductive levels. In the Kavalla Phase began during the early cool/moist interval as suggested the river should have been less productive than at present. A possibility exists that climatic differences may have altered spawning run timing, to make the fish more available at particularly desirable times, or that a particular species became more abundant at the appropriate time.

The data relevant to the Kavalla Phase subsistence pattern must be considered tentative. Given the relatively frequent occurrence of large cerulean points irrespective of the phase (23) of projectile point technology it appears that full-scale utilization of the area was evident by the end of later occupations had been achieved by this time. The Kavalla Phase represents the culmination of a series of subsistence and technological patterns that prevailed with minimal adjustments until the introduction of the horse and European cattle groups.

Toward the middle of the Kavalla Phase the cool/moist climatic conditions that prevailed earlier ameliorated and the modern Mediterranean began to emerge. The change in climate initiated the transition to dominant climax vegetation that was probably essentially complete near the end of the Kavalla Phase (ca. A.D. 200). Possibly as a result of relative climatic stability there appears in the geomorphological record an interval of intense soil formation with strongly developed B<sub>1</sub> and B<sub>2</sub> soil horizons that probably began either near the end of the Kavalla Phase or the beginning of the succeeding phase.

The Stonenill Phase (ca. A.D. 200-700) is a default culture type. In the field and while doing analysis a series of roughly triangular projectile points with relatively wide, shallow notches ranging from side-notched to corner removed were identified (Fig. 5.11, 5.12). These projectile points give the impression of a tool manufactured with little consideration for a particular template. Most are comparatively thick and exhibit limited retouch or edge regularization as a process of their manufacture. The sample of points placed in the type is sufficiently heterogeneous that typologists with a tendency to split rather than lump might well have created ten or more separate classes.

The closest analogue to this series of projectile points with a similar function is the Besant projectile point of the Northwestern United States. The correspondence between the Lincoln County points and Besant is a rather distant one. Many of these would be accepted in a Besant context with little hesitancy, others would most decidedly not, and vice versa. For lack of a better line on which to hang this collection of projectile points I have chosen Besant as a temporal designation. A considerably older date from 24BN525 was intended to provide a firm anchor on this manifestation. Charcoal from a hearth-

$2350 \pm 70$  B.P. (TX-3226), which corrected reads  $2437 \pm 174$  or 487 B.C. (Damon and others 1974), well within the projected time interval of the Kavalla Phase. The date derives from a stratum that immediately overlies the stratum that contained four notched pebbles. Unfortunately, the only other artifacts produced by excavations were a side-end scraper and a retouched piece. At 24LN1120 five notched pebbles appeared in Area C where projectile points attributable to the Kavalla Phase or later manifestations comprise 99% of the projectile point assemblage. A similar picture holds true for 24LN1125 where notched pebbles (net sinkers) appear to associate with materials of Kavalla Phase age or later.

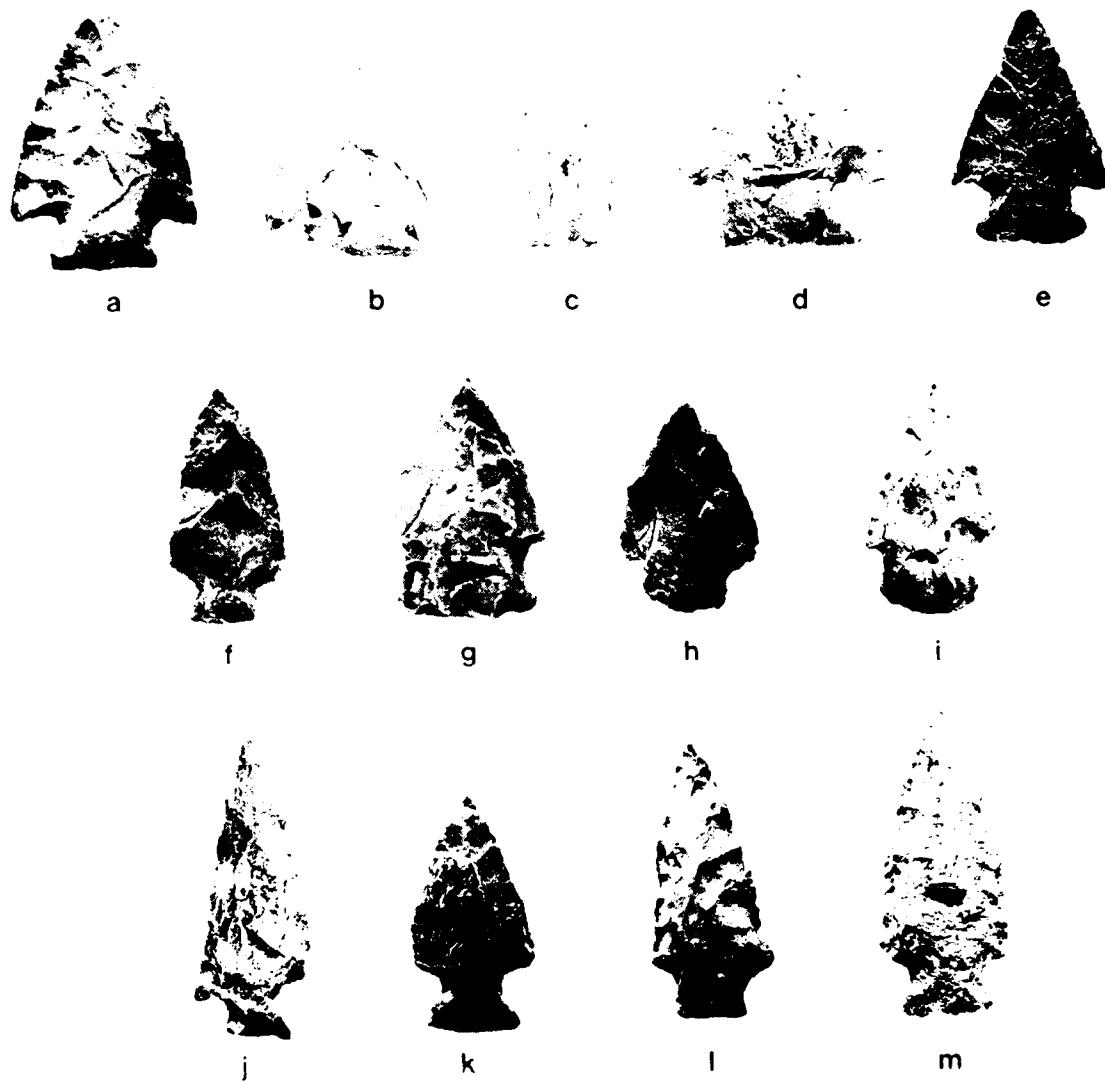


Figure 5.10. Projectile points of the Kavalla Phase. (a - e, Type 4; f - i, Type 5; j - m, Type 6) (a and f, 24LN10; b, c, g, and j, 24LN528; d, h, and k, 24LN1020; l, 24LN1124, e, i, and m, 24LN11125) (scale 1:1).

If notched pebbles are indicative of fishing activity, where they are often identified as net weights, then it may be that with the Kavalla Phase we see intensification, if not introduction, of emphasis

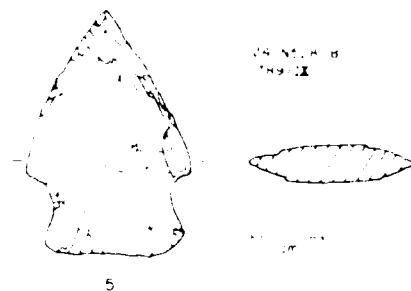


Figure 5.8.

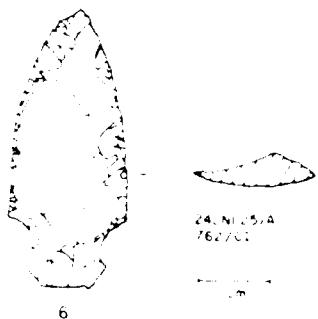


Figure 5.9.

Kavalla phase is the triangular, expanding base, corner-notched projectile point. Similar specimens are attributed to the Pelican Lake Phase (ca. 1000 B.C.-A.D. 200) in the Plains sequence (Reeves 1969) and the early portion (ca. 800 B.C. - ?) of the Harder Phase in the Lower Snake River typology (Leonhardy and Rice 1970). In our sample we observed sufficiently substantial variation on the corner-notched theme that three types (4, 5, and 7) (Fig. 5.7 - 9 and Fig. 5.10) were identified. Whether these are morphological variations within a chronological type is uncertain. At present it seems most appropriate to subsume all of the observed variations of the corner-notched points in the Kavalla Phase. Distributions of projectile points associated with the Kavalla Phase are enumerated in Table 5.3.

Table 5.3. Distribution of projectile points affiliated with the Kavalla Phase.

Type	Site (24LN )					
Corner-notched Variation	10	528	1020	1124	1125	TOTAL
Type 4	4	11	11	0	26	52
Type 5	2	9	5	0	6	22
Type 6	1	1	3	2	8	15
Total	7	21	19	2	40	89

We were able to locate a single charcoal sample in what appeared to be a reliable context associated with a single Type 4 corner-notched projectile point. The sample from 24LN1125, Area E, Unit 2240, Level II, yielded a date of  $2530 \pm 145$  C-14 years B.P. (GX-7290), which corrects to  $2644 \pm 204$  B.P. or 694 B.C. (Damon and others 1974). This date is, of course, consistent with the dates from both Plains and Plateau contexts where similar projectile point forms appear.

Artifacts diagnostic of the Kavalla Phase other than projectile points are difficult to discern. One possible class of tools that may represent a first appearance is notched pebbles. At 24LN1029, charcoal from a hearth at one meter below surface produced a date of

Elements indicative of the Calx Phase increase dramatically over those of the Bristow Phase in the floodplain of the Kootenai Canyon Locality. Of six sites excavated or extensively tested, five yielded projectile points. At least one projectile point representative of the proposed Calx Phase appeared in each of those five sites (see Table 5.2 for distributions). The implications of the observed increase in occurrence of these materials are, of course, uncertain. It provides the earliest indication of a relatively widespread manifestation in the Kootenai Canyon Locality floodplain deposits. One possible picture is that of a relatively low population density group in the process of acclimating themselves to the exigencies of a new habitat. The alternative is that the heavy erosional cycles of the early Holocene were finally beginning to abate and greater quantities of cultural debris were preserved in the deposits.

Table 5.2. Distribution of projectile points affiliated with the Calx Phase.

Type	Site (24LN )					
	10	528	1020	1124	1125	TOTAL
Lanceolate Basally Indented Type 9	1	3	3	0	5	12
Stemmed Basally Indented Type 8	3	4	1	1	11	20
Total	4	7	4	1	16	32

Given the nature of the temporal distribution of similar point styles in the Plains, we may ultimately discover that the stemmed basally indented forms of the Kootenai Region appear in later contexts than the lanceolate basally indented types. I suspect that the Calx Phase will invariably appear as a limited expression and that it will prove difficult to identify a clearly defined temporal separation. Should temporal differentiation prove possible I would propose utilization of Roman numerals added to the phase name to separate the two expressions (Calx I and II).



Figure 5.7.

The Kavalla Phase was apparently initiated near the midpoint (ca. 1000 B.C.) of the brief reversal to cooler/moister conditions indicated by the vegetative change recorded in pollen records. Most of the materials indicative of the Kavalla Phase probably postdate a brief erosional cycle observable in the geomorphology of the T2 terrace. It appears that during this particular erosional event the earlier constructional T2 terrace was planed and established as an erosional surface in most places. The key artifact of the

elements used to identify the Bristow complex come from limited surface collections at several badly eroded sites along the shoreline of Lake Koocanusa. The associations of the various elements are, at best, tenuous. For the time being, I will leave the Bristow Phase as a putative phase with a poorly described inventory. Indications of the Bristow Phase in the Canyon Locality are pervasive but limited. The Bristow Phase is most prominently represented in eroded terrace sites of Lake Koocanusa at or near maximum pool (approximate elevation 2400-2450 ft a.m.s.l.). Despite the fact that most occurrences have been noted on the high terraces, materials do appear rarely in floodplain sediments. Whether the noted distributions reflect actual settlement preferences, sampling vagaries, or differential preservation remains to be determined.

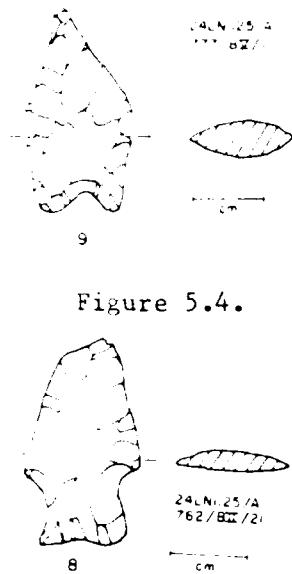


Figure 5.4.

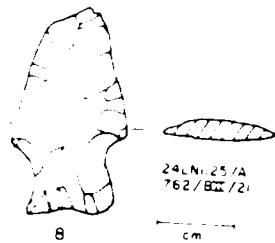


Figure 5.5.

The succeeding Calx Phase (ca. 2500-1300 B.C.) correlates with the transition from conditions that are warmer and drier than present to a cooler and moister climate than exists today. The 32 projectile points used as identifiers of this phase are of two varieties. If the Plains sequence is valid in the Kootenai Region the earliest form should be the lanceolate basally indented type (Fig. 5.4 and 5.6a-d). Called the McKean point on the Plains (Wheeler 1952), this form is attributed to the time between about 2500-1500 B.C. (Reeves 1969). Stemmed, basally indented projectile points (Fig. 5.5 and 5.6e and f) are presumed to affiliate with but initially appear somewhat later than the lanceolate basally indented forms. These forms appear analogous to the Plains Duncan and Hanna types (Wheeler 1954) typically dated at about 1500-1000 B.C. (Reeves 1969).

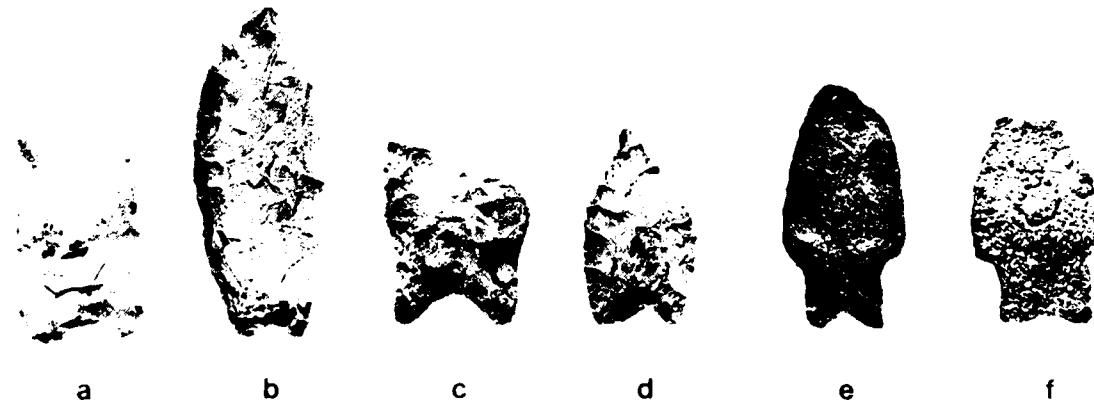


Figure 5.6. Projectile points of the Calx Phase. (a - d, Type 9; e and f, Type 8) (a, 24LN10; b, 24LN528; c, 24LN1020; d - f, 24LN1125) (scale 1:1).

morphologically identical points (Roll and Bailey 1979:Fig.8, k-n) in arguable context with some other tool forms. Choquette and Holstine (1980:41-42) have identified these materials as part of the Bristow complex to which they attribute a time span between 8000-5000 B.P. (6000-3000 B.C.). I propose to retain the name "Bristow" but to designate it as a phase of somewhat shorter duration (3500-2500 B.C.). The hallmark artifact is the large basally indented projectile point (Figs. 5.1, 5.2a-c) with wide shallow side notches set low on the blade, reminiscent of the Plains "Oxbow" type (Nero and McCorquodale 1958, Wetlaufer 1960).



Figure 5.2. Projectile points of the Bristow Phase. (a - c, Type 11; d - g, Type 10) (a and b, 24LN10; c, 24LN528; d - g, 24LN1125) (scale 1:1).

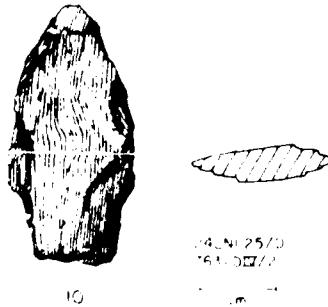


Figure 5.3. Points are of the same age as other Bristow Phase materials is uncertain. Perhaps they are elements of a preceding cultural entity. At the present they will be included as elements of the Bristow Phase.

Choquette and Holstine include "large side- and corner-notched projectile points" and other implements, in particular edge abraded cobbles, as elements of their Bristow complex. Most if not all of the

are simply expedients that ignore the enormous creative potential of indigenous people adapting to and modifying their immediate environment. Knowledge of where a trait came from is usually of less value than knowing how it was used and where it fit in the local cultural adaptation. Although we have been obliged to import our chronological control the subsistence strategies are local.

By 9,000 B.C., and quite probably earlier, the mountain glaciers and glacially impounded lakes that filled the Kootenai Valley had receded, the post-glacial vegetation succession had begun, and the terrain was opening for human occupation. Available data offer little to document the first human occupancy of the Kootenai Valley; in fact, in the Canyon Locality, we have yet to find unquestionable evidence of human habitation earlier than about 3500 B.C. There is little question in my mind that earlier people appeared in the Kootenai drainage, but evidence of such occupation remains elusive.

Geomorphological evidence indicates that the two high terraces (T3 and T4), which lie at elevations of about 30 and 38 meters above the modern river level, were established and potentially available for human occupancy since sometime before 7000 B.C. Probably sometime during that time interval (between 9000 and 7000 B.C.) the earliest of the Holocene alluvium (Qae) was deposited and the highest of the floodplain terraces (T3) was established as a constructional terrace. The presence of buried weakly developed soils suggests at least a brief episode of surface stability after deposition of the Qae. Erosional unconformities document a period of relatively intense erosion sometime after 7000 B.C. but before the deposition of Mazama-Ash at about 4700 B.C. The alternating periods of deposition and erosion may account for our failure to locate evidence of human occupancy in floodplain sediments. Remains may be so infrequent that they would be identified only under the most favorable (and fortunate) of circumstances.

Beginning at about the time of the Mazama Ashfall palynological records document a shift from the cooler/moister post-glacial climate of the interval from pre-9000 to about 5000 B.C. to conditions that were both warmer and drier than at present. This shift in climatic conditions has been consistently identified by palynological studies throughout the Pacific Northwest (see Chapter 3). If the Barrier Falls subarea represented a reservoir of unexploited resources, this is the time that we would expect intensified human expansion into the mountainous expanse from areas suffering reduced potential for human exploitation.

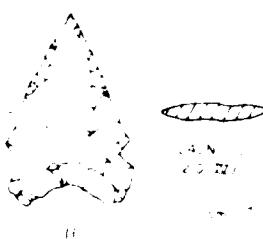


Figure 5.1.

Sometime after the deposition of the Mazama Ash but before 2000 B.C. we see the first tentative evidence of utilization of the floodplain terraces in the Canyon Locality. Evidence from excavated contexts is scanty, consisting of three projectile points, two from 24LN10, one from 24LN528 and possibly three more from 24LN1125 (see discussion below). Were this the only available evidence these would be lumped with succeeding manifestations. Surface collections from the exposed higher terraces on Lake Koocanusa contain

TABLE 5.1. Alpine climate, biotic, vegetal, and physical characteristics of the various stages.

PHASE NUMBER	PERIOD	CLIMATE	VEGETATION	ROBERTED WATER/RIPIC TERRAINS
1450	-	-	Initiation of modern dominent climax vegetation	Modern vegetation - cutting of weak soils on late Holocene alluvium (Q <sub>1</sub> ) and Modern alluvium (Q <sub>2</sub> )
YANSHI	1450	EMERGENCE OF THE MOUNTAIN CLIMATE	First sustained appearance of <u>Tsuga</u> heterophylia at McKillop Creek Pond and Tepee Lake	Deposition of Late Holocene Alluvium (Q <sub>2</sub> )
MAKEX	1000	-	Abies and Picea continue <u>Larix/Pseudotsuga</u> associates Other AP types rare	Erosion development of T <sub>1</sub> erosional terrace
SUNSHI	-	-	NAP types such as <u>Artemisia</u> and <u>Gramineae</u> are minor taxa (4%)	Stability, intense soil formation strongly developed by fir horizons
A.D. 1800	800	-	Abies and Picea surge - to 5%	Deposition of Late Middle Holocene Alluvium (Q <sub>3</sub> )
KAYAIA	1200	WATER SPILLS	<u>Larix/Pseudotsuga</u> - prominent associate to Diploxyylon Pine increases compared to Diploxyylon	Erosion - development of T <sub>2</sub> erosional terrace
CALX	2000	WATER MOISTER CONDITIONS	Increase in AP with further decline in <u>Artemisia</u> (5%)	-
BRISTOL	3000	-	Diploxyylon Pine prominent Decline in <u>Artemisia</u> and <u>Gramineae</u>	Deposition of Early Middle Holocene Alluvium (Q <sub>4</sub> )
	4000	SHIFT TO WARMER/DRIER CONDITIONS THAN PRESENT	<u>Larix/Pseudotsuga</u> prevalent <u>Picea</u> sporadic Abies present at about 2% NAP record sparse with exception of chenopods	-
	5000	-	-	MAZAMA ASHFALL
	6000	-	Rapid increase in <u>Artemisia</u> similar but erratic increase in graminee Artemisia most prevalent NAP type Abies and Picea decline (occur sporadically) Pine 50% of pollen sum Hap./Dip. ratio about 1:1	Deposition of Early Holocene Alluvial surfaces
	7000	CONTINUED COOL / POSSIBLY MOIST BUT DRIER THAN ZONE I	<u>Larix/Pseudotsuga</u> occurs regularly Compositae and Chenopods present Umbelliferae common but in low numbers Other NAP sporadic and rare	Brief episode of surface stability with formation of weakly developed soil in Qae
	8000	-	-	T <sub>2</sub> constructional terrace formed
	9000	-	AP Pollens dominate <u>Pinus</u> 72% (Hap. prominent) of non-aquatic pollen Abies and Picea prominent (to 4%) <u>Alnus</u> ubiquitous in all samples NAP - <u>Artemisia</u> and <u>Gramineae</u> dominate (7% ea.) Various Composites and Chenopods Aquatic Pollen <u>Muphar</u> and <u>Sedge</u>	Deposition of Early Holocene Alluvium (Q <sub>5</sub> ) Deposition of channel lag deposits Deposition of point bar gravels Formation of T <sub>3</sub> terrace Draining of lake system Formation of T <sub>4</sub> terrace Ice recession - formation of ice marginal proglacial lakes
PRE-9000	1	WATER SPILL	-	-
	PRESENT	-	-	-

In this definition both the temporal span and the spatial extent are dependent on the nature of the manifestation and the perception (as always) of the interpreter. The spatial dimension is left deliberately vague to permit application of the construct to human adaptations that exhibit substantial geographic distribution and to those with more limited distributions without the limitations imposed by relatively precise spatial limits. In this discussion the use of the phase will be restricted to the Canyon Locality as available data are practically limited to that terrain. It is anticipated that the phase constructs described will be applicable for a substantially larger spatial area, but that distribution will have to await the accumulation and analysis of additional information.

To be of real utility the concept of phase must be an element in a larger integrative scheme. Willey and Phillips (1958) provided a pair of "integrative units," horizon and tradition. The horizon as described by Willey and Phillips will not be used here and, as a result, receives no further discussion. A tradition will be posited as a potentially useful integrative concept and will be used essentially as proposed by Willey and Phillips (1958:37):

... an archaeological tradition is a (primarily) temporal continuity represented by persistent configurations in single technologies or other systems of related forms.

#### The Local Sequence

The sequent phases described below consist primarily of a projectile point chronology established by typological cross-dating with radiocarbon and/or stratigraphically controlled types from adjacent areas. In those instances when locally available information permits, tool forms other than projectile points are added to the material content that contributes to phase definition. The sequence is related to major environmental and geomorphic events identified by studies of local geomorphology and palynology (see Chapters 2 and 3 and Table 5.1).

There are several reasons to establish a sequence distinct from those of surrounding areas despite the fact that they provide the primary source of chronological control. It has already been shown that the Barrier Falls subarea differs dramatically from surrounding areas both in kinds and abundance of resources available for foraging human populations (Chapter 2). Although none of the resources of the Barrier Falls subarea is unique to that subarea, the locally available resources do provide a unique configuration that requires an adaptive strategy different from either the Plateau or the Plains. The sequence described for the Canyon Locality is intended to express local subsistence adaptations as discrete entities.

Conceptually, the expression of a local sequence tends to focus our attention inward. We begin to attempt explanations that focus on internal rather than external forces as elements in local development. Explanations dependent on diffusion of traits or migration of people

precise definition or implementation of Willey and Phillips' (1958) "basic archaeological" and "integrative" units there is a mutual appreciation of the concepts involved.

Basic to any discussion of the "in the ground archaeology" are two basic terms--occupation and component. As used here an occupation should be interpreted to mean the archaeological remains of a single habitation event. (This implies a non-sedentary settlement without continuous habitation. The definition of an occupation assumes another dimension when habitation is continuous.) A component may represent a single occupation or a series of occupations at a single locus that exhibit essentially no variation in content. Central to the idea of a component as used here is the possibility of reoccupation of a locus by the same people or by people that share the same cultural inventory. Thus, a multiple occupation site might be a site that was occupied several times by the same or essentially identical people. A multi-component site is one that was occupied at different times by people that did not share the same cultural inventories (or who used the site in the performance of different tasks and as a result left behind different inventories).

At another level of abstraction is the phase, described by Willey and Phillips (1958:22) as follows:

. . . an archaeological unit possessing traits sufficiently characteristic to distinguish it from all other units similarly conceived whether of the same or other cultures or civilizations, spatially limited to the order of magnitude of a locality or region and chronologically limited to a relatively brief interval of time.

Rather than limiting the construct by viewing it as "chronologically limited to a relatively brief interval of time" I would prefer that the phrase be changed to indicate that the manifestation is reasonably perceived as an archaeologically synchronic unit,

. . . one in which changes occurred within the bounds of constancy and without upsetting the overall alignment of cultural elements. It is a stationary state in which generalizations as to behavior and style from most of its parts or its most significant parts can be applied to its entirety [Chang 1967:33].

An appropriate statement might combine the above statements to read

A phase is an archaeological unit possessing traits sufficiently characteristic to distinguish it from all other units similarly conceived, whether of the same or other cultures or civilizations. The configuration of distinguishing traits is such that generalizations as to behavior and style from most of its manifestations can be applied to the entirety, permitting treatment as a stationary state. The spatial dimension is variable and depends upon the areal distribution and definition of the synchronic entity.

The essence of Choquette and Holstine's scheme is probably correct (I feel some dates require revision, and some additional classes are needed) and the scheme would probably gain currency if it were not for three factors. First, the reader is left with no definition of the term "complex." The term is used without reference to other archaeological classificatory schemes so there is no indication that it is or is not part of a taxonomic hierarchy or some other device. Is it equivalent to a phase as defined by Willey and Phillips (1958) or does it equate with some other taxon in another system of order? How does one complex compare with another? Can contemporaneous complexes exist? In short, the nature of this archaeological abstraction remains undetermined. Second, the use of difficult to pronounce native terms to designate taxonomic classes is inappropriate. While the use of such terminology eliminates the problem of pejorative meaning because of association with English usage, the terms chosen should fit readily into the phonological structure of the audience for which they are intended. Three of the "complex" names (Iníssimi, Akiyínek, and Akahónek) are not readily incorporated by speakers of Standard American English. Third, two of the terms chosen (Akiyínek and Akahónek) violate the non-pejorative advantage of using native terminology in classificatory schemes. Akiyínek specifically refers to the Libby-Jennings Kutenai band (Choquette and Holstine 1980:26) and Akahónek to the Tobacco Plains Kutenai (Choquette and Holstine 1980:47). In fact, these relationships are a deliberate part of their scheme. They state with little apparent reservation "... it is thought that the Akiyínek complex represents the ethnographically known Libby-Jennings Kutenai band of the same name [Choquette and Holstine 1980:46]." While their affiliation of archaeological remains with particular ethnic groups may be correct I know of no scientific mechanism for validating a relationship that extends over a temporal span of some 1000 years. The nature of social interaction over such a time span precludes precise identification and the value of doing so is questionable.

Other aspects of the Choquette-Holstine formulation are less open to relatively simple discussion. It includes several interpretive variables the foremost of which is the association of lithic types and sources with cultural complexes. It will suffice to state at this point that the results of our analyses fail to corroborate the association of particular lithic types with any cultural-temporal entity (Appendix I, Artifact Descriptions, Libby Additional Units and Reregulating Dam Cultural Resources Project 1979: Descriptive Archaeology. [Roll and Smith 1982]).

## THE CULTURAL TYPOLOGY

### Framework and Definition of Terms

Any typology is a convenient heuristic device by which order is imposed on the universe under consideration. So long as the device contributes to communication of concepts by members of the concerned community it has utility. For these reasons it seems advisable to utilize a scheme that most archaeologists share in at least a vague consensual manner. Although archaeologists may disagree on the

## PREVIOUS REGIONAL TYPOLOGIES

The cultural typology developed here is not the first for the region. Malouf (1956) presented a synthesis that geographically encompassed essentially all of Montana and parts of Alberta, British Columbia, northern Idaho, and eastern Washington. He placed the sparse information available at that time in three "horizons." Only the last two horizons, the Foragers and the Hunters, were identified in his "Montana Western Region." There were no representatives of his early horizon identified in the Montana Western Region. Radiocarbon dating was still in its infancy at the time Malouf's work was done and, as a consequence, he justifiably hesitated to provide chronological estimates. Malouf obviously considered habitation in his Montana Western Region a relatively recent phenomenon, partially attributable to late withdrawal of glaciers and the associated large glacial lakes.

A more intensive survey of the proposed Libby Reservoir area within the United States than the Smithsonian survey of 1950 was undertaken by the University of Montana in 1966 and 1967. Materials recovered during this survey were discussed in terms of three periods: Prehistoric, Protohistoric, and Historic. The Prehistoric Period was divided into three additional periods: Early Prehistoric (10,000 B.C. - 5000 B.C.), Middle Prehistoric (*ca.* 3000 B.C. - A.D. 500), and Late Prehistoric (*ca.* A.D. 500 - 1800) (Taylor 1973:112-121). Like Malouf, Taylor notes the absence of Early Prehistoric diagnostics in the 1966-67 collections. Taylor (1973:113) adds "We suspect that if ancient sites do lie along the river they are apt to be either deeply buried under flood deposits or situated on terraces well above the Kootenai's floodplain." Roll (1979) used a similar scheme to order prehistoric materials found in test excavations found at the Fisher River Site (24LN10).

The intensity of cultural resource investigations in the U.S. portion of the Kootenai Region upstream from Libby, Montana, has increased by a substantial magnitude since 1975. Choquette and Holstine (1980) have offered a comprehensive characterization of regional prehistory based on Choquette's extensive experience in the Kootenai on both sides of the international border. Choquette and Holstine identify five "complexes" and a "transitional" period. The "complexes" and their approximate temporal sequence are as follows:

1. Akahónek Complex (A.D. 1400 - Historic [?])
2. Akiyínek Complex (A.D. 950 - 1400)
3. Transitional (50 B.C. - A.D. 950)
4. Iníssimi ("Rainbow") Complex (3000 - 50 B.C.)
5. Bristow Complex (5000 - 3000 B.C.)
6. "Early" Complex (Pre-5000 B.C.)

The complexes identified by Choquette and Holstine are comprised of sets of diagnostic artifacts, technologies, lithic suites, settlement patterns, and subsistence patterns, tied to a paleoenvironmental reconstruction and chronologically ordered.

The Kootenai River valley, however, is not the Northwestern Plains. The various point styles that are present are not the same as described for the Plains. We have several close analogues to Plains types, but we also have several types not found or recognized as discrete types of the Plains. Moreover, we also have points vaguely analogous to those found on the Columbia Plateau. In several instances, Plains and Plateau styles are broadly similar, but have somewhat different temporal ranges. A single type in our collection may combine two or more morphologically similar but temporally divergent types from surrounding areas.

We feel it is possible to characterize the intensity of site occupation through time by looking at the relative frequency of point types which appear to be good time markers in other areas. However, we cannot simply seriate our assemblages from the raw data. There is nothing internal to the assemblages to use as either a start or end point. By typological cross-dating we can make some rough correlations even though only select point forms appear to be relatively time diagnostic. The bulk of points that associate with Mulloy's (1958) Late Middle Prehistoric Period are not readily ordered chronologically with respect to one another. The failure of the seriation technique to identify key elements of content and time led to other potential sources of chronological control.

In the absence of locally derived chronologies and cultural sequences we are forced to look elsewhere for potentially analogous information. Immediately west of the LAURD project area relatively intensive work at Kettle Falls on the Columbia River (Chance et. al. 1977) has produced a rudimentary scheme. Farther south, along the lower Snake River, Leonhardy and Rice (1970) have developed a suitable cultural typology. Across the Rockies, on the Northwestern Great Plains, the most commonly cited cultural chronological framework is that of Reeves (1970).

All of these classificatory schemes establish a series of sequent phases that delineate aspects of cultural response through time. Each attempts to utilize artifact assemblages, faunal assemblages, lithic suites and other attributes combined with available environmental information (geomorphology, soils, palynology, paleoclimatology, and others) to define their respective phases or complexes. In these, as in most other such archaeologically based schemes, the identification of phase or complex affiliation depends on the presence or absence of an extremely small range of tool types that exhibit observable stylistic variation over relatively brief temporal intervals. The number and frequency of such tool types vary from area to area and from phase to phase.

The phase constructs developed for the Kootenai Region depend upon typological cross-dating from adjacent regions combined with local geomorphological and palynological and limited radiocarbon controls. The methodological stance taken is that regardless of the sources of cultural input into the Kootenai Region that input resulted in a unique, in situ expression of adaptation to a unique cultural-environmental setting.

#### APPROACHES TO ORDER

Initial attempts to arrive at some sort of internal order without reference to previously developed typologies or chronologies included the use of seriation. The failure of this technique to produce any clear-cut order in our sample of projectile points seems to lie in several ambiguities in our data (in particular small sample size) and some of the assumptions elementary to the seriation model. Seriation is based on changes in stylistic motifs. The change exhibited may occur over time or across space. An underlying assumption is that each seriated attribute had a unimodal distribution curve and that several motifs were in existence at any point in time. Obviously, almost any class of man-made objects may be subjected to seriation. Whether that seriation produces the desired temporally ordered sequence must be evaluated by independent means.

In dealing with projectile points we are faced with the problem that the observed attributes may not represent stylistic motifs but may relate directly to the projectile system employed. If this is the case replacement of one projectile system with another may require or be perceived as requiring an entirely different set of attributes. The two systems would not necessarily exhibit any temporal overlap or, as stated above, the distribution curves of the identified motifs may be discontinuous.

Seriation has been attempted on non-stylistic attributes with some success. However, it cannot work unless there is some a priori reason for assuming unimodal popularity curves through time and some overlap of the attributes being seriated. Lithic tools are combinations of use (commonly referred to as functional) and stylistic attributes, and a specific type is probably defined on the basis of clusters of both kinds of attributes. Therefore, the possibility of serious error is introduced from the start. Still, the technique might be applied if the other assumptions can be met.

We know from archaeological research on the Northwestern Plains that several types of projectile points existed through time. We have some knowledge of the relative sequence with which one replaced the other. However, we also know that, for the most part, no temporal overlap has been demonstrated between most of those types and the ones that preceded or replaced them. (The exception to this statement is the Besant-Avonlea overlap, but, interestingly, the two types have not yet been identified in association with one another.) Invariably, when Northwestern Plains single occupation (or at least single component) sites appear in adequately sealed deposits they exhibit a single projectile point form with some manufacturing and stylistic differences for the weapon system. Temporal overlap almost certainly occurs, but the time period of that overlap may be so small as to defy detection. Thus, seriating assemblages which contain various percentages of artifacts that are known not to overlap in time cannot provide a measure of relative temporal ranking. It provides a measure of site disturbance and admixture.

like feature appeared to be in context with a projectile point from the same level and subunit (50x50 cm). Analysis produced a date of  $905 \pm 220$  C-14 years B.P. (GX-7286) which using the correction of Damon and others (1974) converts to  $893 \pm 253$  B.P. and indicates a date between A.D. 303 and 1309 at one sigma. While the date seems too recent, if the earlier range indicated is accepted it does become remotely plausible. I am relatively comfortable with the time periods and typological identification of most other projectile point forms from the LAURD collections; I am rather distressed with this series.

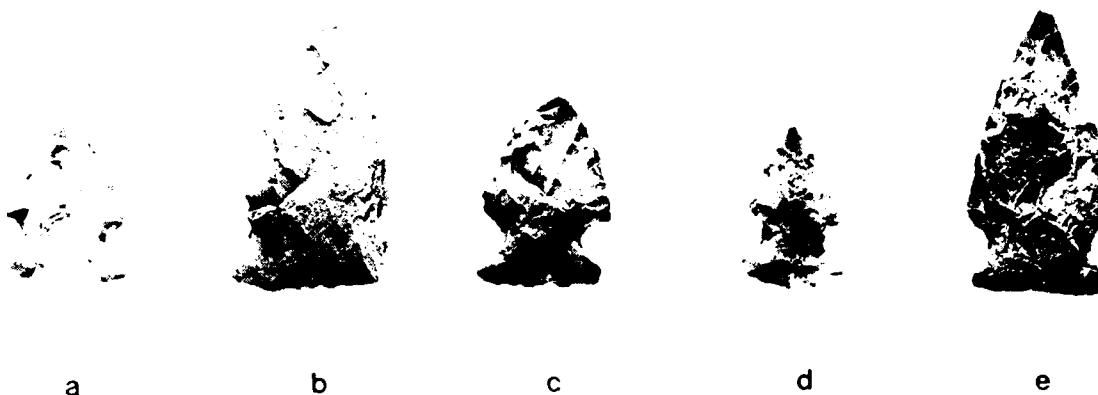


Figure 5.12. Projectile points of the Stonehill Phase. (a, 24LN10; b, 24LN1020; c and d, 24LN1124; e, 24LN1125) (scale 1:1).

The Stonehill Phase is well represented in the 1979 LAURD assemblages as 74 or 19% of all projectile points found are assignable to the type. The occupation identified at 24LN1029 appears directly assignable to the Stonehill Phase as 11 of the 14 projectile points found (79%) are adequate representatives. Two of the points found were assigned to the immediately preceding Kavalla Phase but their morphology would permit inclusion within Stonehill assemblages. The remaining specimen was identified on the basis of morphology as representative of projectile point forms herein attributed to the substantially earlier stemmed, basally indented types of the Calx Phase. The occurrence of a single projectile point might be indicative of an array of possible factors and is of little consequence at this juncture. The distribution of projectile points from the 1979 LAURD excavations assigned to the Stonehill Phase is presented in Table 5.4.

Table 5.4. Distribution of projectile points affiliated with the Stonehill Phase.

Type	Site (24LN)					TOTAL
	10	528	1020	1124	1125	
Large triangular open side-notched to corner removed (Type 7)	8	12	21	11	21	74

We may determine eventually that the Stonehill Phase represents no more than a continuation or elaboration of the Kavalla Phase and

may, in fact, be a totally coeval or even earlier manifestation. The current placement of the Stonehill Phase is a decision made on the basis of impressions gained from excavation and analysis. It may be incorrect. From the standpoints of both subsistence and technology, the only discernible difference between the two (at this time) is a relatively minor difference in projectile point morphology.

All of the preceding phases contain a single element in common, the projectile system was dependent upon direct thrust or throw or use of the throwing stick or atlatl for propulsion. Apparently, the advent of the bow and arrow resulted in a reevaluation of the desired projectile point form and on the basis of this new technology the Warex Phase (A.D. 500-1200) is defined. The Warex Phase is identified by a series of projectile points that are morphologically and technologically similar to, if not identical with, the Avonlea projectile points of the Northwestern Plains Avonlea Phase (A.D. 200-700) (Reeves 1969). Avonlea points were first identified in the literature by Kehoe and McCorquodale (1961) who treated them as an early horizon marker of the Northwestern Plains Late Prehistoric Period. Kehoe and McCorquodale's original geographic distribution of the Avonlea phenomenon was expanded substantially by Davis (1966) and subsequent discoveries have identified Avonlea projectile points over much of eastern Montana, western North Dakota, and the southern two-thirds of the Canadian prairie provinces. A summary of then available chronological and geographical data by Johnson (1970) identified only one site west of the continental divide in Montana as containing Avonlea-like projectile points.

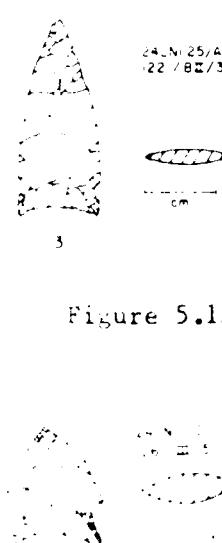


Figure 5.13. straight basal profiles. Although not yet quantified, a relatively high percentage of Avonlea points exhibit some evidence of basal grinding. Reeves (1970) identifies the long triangular side-notched form as "Timber Ridge Side-notched" and the shorter form as "Head-Smashed-In Corner-notched" and indicates the corner-notched as generally earlier. Kehoe (1966) utilizes the "type-variety system" and defines an Avonlea type that from his illustrations corresponds approximately with Reeves' Head-Smashed-In Corner-notched and then identifies three varieties of the type: Figure 5.14. "Gull Lake 'Classic,'" "Carmichael Wide-eared," and "Timber Ridge Sharp-eared." The possible implications of the various Avonlea types or varieties have not been extensively examined. In my own experience along the eastern slope of the Rocky Mountains in Montana, side-notched Avonlea points stand out as the dominant form.

Table 5.5. Distribution of projectile points affiliated with the Warex Phase.

Type	Site (24LN )					
	10	528	1020	1124	1125	TOTAL
Thin triangular with low-set side-notches (Type 3)	22	8	2	0	30	62
Thin triangular with shallow corner-notches (Type 2)	11	12	1	0	10	34
TOTAL	33	20	3	0	40	96

The original radiocarbon dates associated with the Avonlea Phase in Canada indicated a temporal span of about 500 years (A.D. 200-700). A recent compilation of Montana radiocarbon dates (Davis 1982) lists 12 dates associated with the Avonlea Phase in Montana east of the continental divide. An additional six dates from the LAURD project were intended to date the Avonlea equivalent manifestation west of the divide. The resultant radiocarbon dates are presented in Table 5.6.

Table 5.6. Montana Radiocarbon Dates for Avonlea and Warex Phases.

Site Number	Site Name	Lab Number	Uncorrected Date B.P.	Corrected Date A.D.
<b>Montana East of the Continental Divide (Avonlea)</b>				
24BL101	Timber Ridge	GX-1194	980+110	988+166
24BW675	Pilgrim	RL-1412	1480+130	488+178
24CH68	Lost Terrace	I-9048	1045+80	919+148
		RL- 818	1110+100	850+164
24MA126	Jordan Creek	RL-1224	940+110	1011+166
24PH794	Henry Smith	RL-1512	1120+100	850+164
		RL-1513	1070+100	896+161
		RL-1514	1040+100	919+159
		RL-1515	1100+110	873+171
24WX23		WSU-2387	1380+80	587+146
24WX30	Goheen	WSU-2391B	1270+60	709+144
		WSU-2382	1080+90	896+156
<b>LAURD Project Area (Warex)</b>				
24LN528		GX-7287	630+140	1302+187
24LN1030		WSU-3251	890+70	1056+142
24LN1036		WSU-1897	1100+80	873+153
24LN1125		TX-3221	610+90	1324+153
		TX-3294	780+50	1169+133
		TX-3297	1020+80	942+148

The range of LAURD dates is decidedly aberrant. Use of the methods advocated by Long and Rippeteau (1974) to evaluate the probability that a series of dates are effectively of the same age would result in rejection of two dates from the sample east of the Rockies and inclusion of only one date from the LAURD sample. Examination of Table 5.6 reveals that most of the Montana Avonlea dates cluster around A.D. 900. If one were to utilize only those dates in Montana east of the continental divide the inclination would be to identify Avonlea as ranging from about A.D. 500 to A.D. 1000 with maximum intensity during the latter half of that span. The early dates for Avonlea in the Canadian Plains establish a lower limiting age for the phase; the later dates from Montana require that the time span of Avonlea be extended from the original A.D. 700 to at least A.D. 900 and more reasonably to A.D. 1000.

If the LAURD radiocarbon dates are indeed representative dates of the Warex Phase and if the Warex Phase projectile points are equivalent to those of the Avonlea Phase, then the LAURD Warex Phase is both later and longer lived than the Plains Avonlea Phase. The probability exists that the radiocarbon dates acquired do not accurately reflect the ages of the manifestation they were intended to date. Both GX-7287 from 24LN528 and TX-3221 from 24LN1125 seem substantially too recent but are marginally acceptable at the lower limits of one sigma. By adopting a moderate picture of the Warex occupations in the Kootenai Region it seems reasonable to suggest a temporal span from ca. A.D. 500-700 to A.D. 1000-1200.

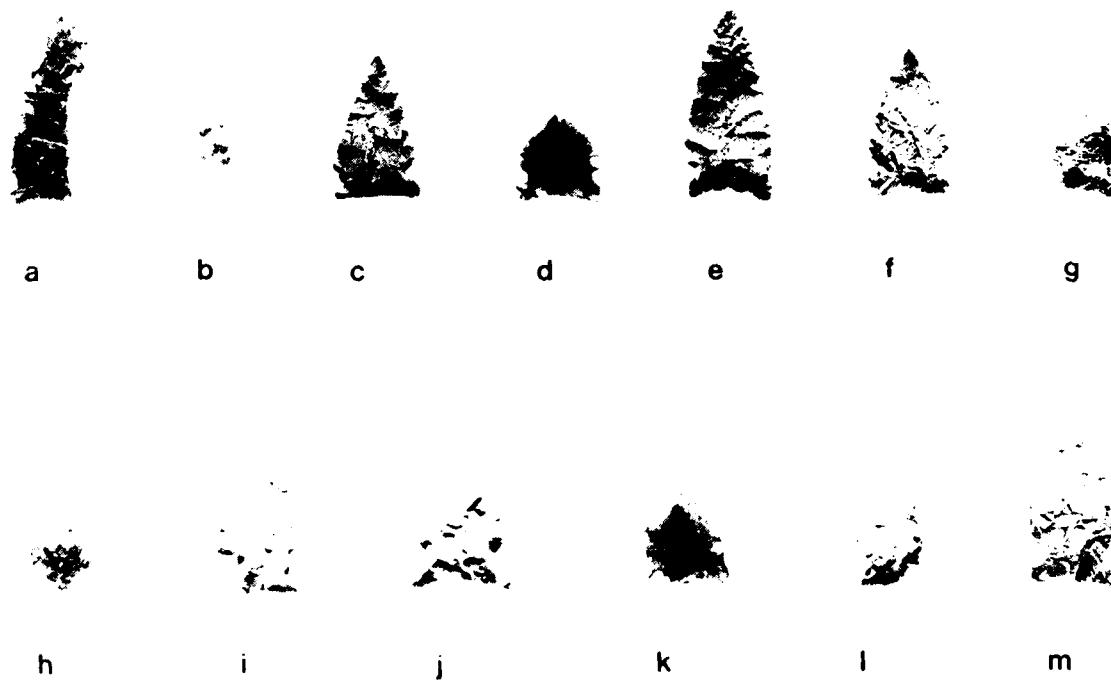


Figure 5.15. Projectile points of the Warex Phase. (a - g, Type 3; h - m, Type 2) (a - c and h-j, 24LN10; d and k, 24LN528; l, 24LN1020; e-g and m, 24LN1125) (scale 1:1).

The frequency of occurrence of Warex Phase projectile point forms is the highest of any recorded during the 1979 LAURD excavations. A total of 96 or 25% of all points were assigned to the types used to identify the Warex Phase. The corner-notched form represented about one-third of the points and exceeded the occurrence of the side-notched form at only one site, 24LN528. From available information provided by geomorphology and palynology, the climate and the associated erosional/depositional regime had attained essentially modern status by Warex Phase times.

The succeeding Yarnell Phase (ca. A.D. 1000-1200 to A.D. 1700-1800) represents the final expression of the prehistoric era in the Kootenai Region. The identifying artifact of the Yarnell Phase is the small, triangular side-notched projectile point. These points differ from those of the Warex Phase in that the notch is invariably placed higher on the blade and typically invades the blade to a much greater extent. On many of the specimens associated with the Yarnell Phase bifacial modification is less extensive than in the preceding phases and often specimens exhibit remnant flake scars created by removal of the flake blank from which the point was produced.

The projectile point form typical of the Yarnell Phase is widely distributed throughout the western United States beginning at about A.D. 800-1200 and continues into historic contexts. The Northwestern Plains equivalent, found in the Old Women's Phase, extends from A.D. 750 to A.D. 1800 (Reeves 1969). In the Plains a range of varieties has been defined on the so called "Prairie Side-notched" and "Plains Side-notched" types (Kehoe 1966) with the Prairie Side-notched varieties considered earlier than the Plains Side-notched varieties. The validity of the types and their varieties has not yet been adequately assessed. Thomas (1981) recently evaluated the Desert Side-notched (and other) points from the Monitor Valley, Nevada and other Great Basin locations. He treats the Desert Side-notched points as a post A.D. 1300 manifestation. Similar side-notched points appear in apparent association with the delicate Columbia Valley Corner-notched and Wallula Rectangular Stemmed as part of the "Piqúin Phase" (A.D. 1300 to A.D. 1700) of the Lower Snake River Region (Leonhardy and Rice 1970) and with other coeval manifestations of the Columbia Plateau. For this part of the intermountain west a date of about A.D. 1200 or even somewhat later for the inception of the Yarnell Phase with its associated small side-notched projectile point is in keeping with available dates on similar manifestations in surrounding areas.

Within the LAURD sample it was possible to identify two variations on the small triangular side-notched theme. Type 1-A points are typically smaller, thinner, and with less distinct notching (Fig. 5.16, 5.18a-c). The angle defined by the base and lateral edges is usually rounded. Lateral edges tend to be irregular with limited but invasive retouch. Type 1-B are longer and wider, with distinct and deep notches (Fig. 5.17, 5.18d-j). Basal corners are sharply defined and the lateral edges straight with finely retouched edges. Side-notches are usually placed higher on the lateral edge than among type 1-

Figure 5.16.



Figure 5.17.

Specimens. The significance of these differences is uncertain. For the time being it seems most appropriate to treat the small side-notched point group as one with several variations on the theme, but with no particular chronological or cultural implications. In the LAURD projectile point assemblage the two variations occur in about equal numbers: Type 1-A--44 (11%), Type 1-B--46 (12%).

The occurrence of projectile points identified as indicative of Yarnell Phase (23%) affiliations is nearly equivalent to that of the preceding Warex Phase (25%), slightly greater than the Stonehill Phase (19%) and identical to the Kavalla Phase (23%). The most recent four phases account for 90 percent of all diagnostic projectile point forms. Distribution of the two identified varieties of the Yarnell Phase projectile points by site is presented in Table 5.7. Excavations at 24LN10 yielded 44 Type 1 projectile points or 45 percent of the total projectile point assemblage from that site. Thirty Type 1 projectile points from 24LN528 represent 33 percent of the point assemblage from that site. Of the remaining sites only 24LN1125 contained as high as 10 percent Type 1 points. Clearly, the preponderance of Type 1 projectile points at 24LN10 and 24LN528 indicates preferential utilization of those sites over the others in our sample during Yarnell Phase times.

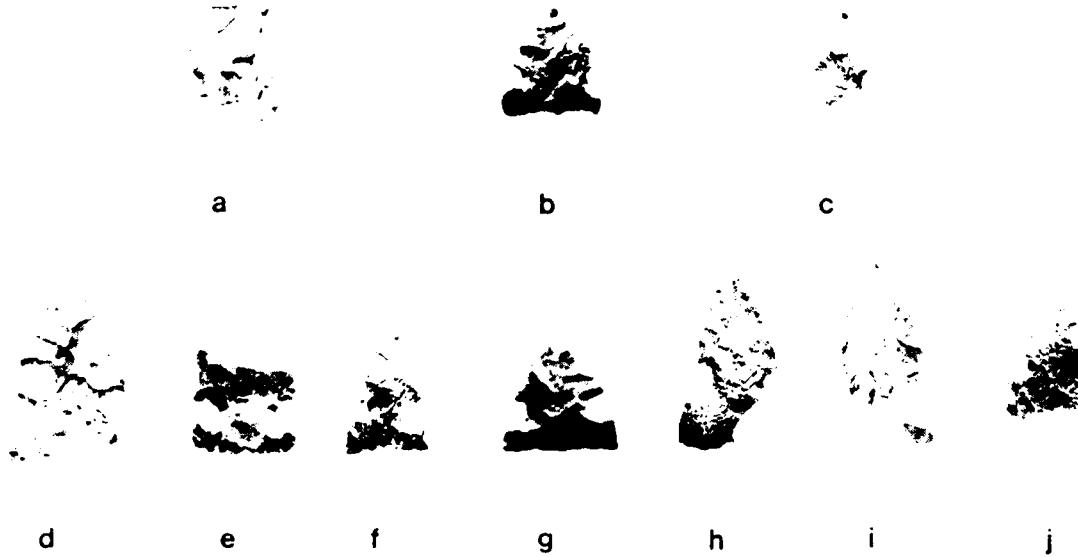


Figure 5.18. Projectile points of the Yarnell Phase. (a - c, Type 1-A; d - j, Type 1-B) (a, d, and e, 24LN10; b, f, and g, 24LN528; h, 24LN1020; c, i, and j, 24LN1125) (scale 1:1).

Table 5.7. Distribution of projectile points affiliated with the Yarnell Phase.

Side-notched Type	Site (24LN )					
	10	528	1020	1124	1125	TOTAL
Type 1-A	28	9	0	0	7	44
Type 1-B	16	21	2	0	7	46
TOTAL	44	30	2	0	14	90

The phases described are differentially represented in the archaeological sites excavated. Representative projectile points of the Kavalla, Stonehill, Warex, and Yarnell Phases appeared about equally in the total projectile point assemblage from all sites combined. The earlier Calx Phase projectile points are far less frequent in their occurrence (about one third that of each of the succeeding phases) and the Bristow Phase barely materializes (two percent of all projectile points). Figure 5.19 illustrates the percentage contribution of the phase affiliated projectile points by total assemblage and by individual site.

On a site by site basis the frequency of phase affiliated projectile points shows some prominent differences. 24LN10 stands out as a predominantly Yarnell and Warex Phase site with those two phases represented by 78 percent of the sites' point assemblage. 24LN528 is dominated by forms associated with the Yarnell Phase (33%) but both Kavalla and Warex Phases are adequately and nearly equally represented (23% and 22% respectively). Stonehill materials stand out at 24LN1020 where they provide 43 percent of all point styles.

The next most frequent forms are those of the Kavalla Phase (38%). Other phases are poorly represented at 24LN1020. The small point assemblage from 24LN1124 (N=14) is dominated by the Stonehill forms (79%) with the similar Type 6 points identified as affiliated with the Kavalla Phase as a minor constituent at 14 percent (2 points). Clearly, this contradicts the contention that 24LN1124 is a single component site. It is noted, however, that the distinction between the two projectile point forms (Types 6 and 7) is not clear cut. A single point of the form identified with the Calx Phase also appeared in the assemblage from this site. It is possible that the site contained more than a single occupation, but the presence of three projectile points is insufficient for much elaboration. 24LN1125 comes reasonably close to the combined projectile point assemblages from all sites. Forms from the Kavalla and Warex Phases are most frequent at 29 percent each. In comparison to the total assemblage the Stonehill Phase is a bit underrepresented (16% vs. 19%) and the Yarnell Phase dramatically so (10% vs. 23%).

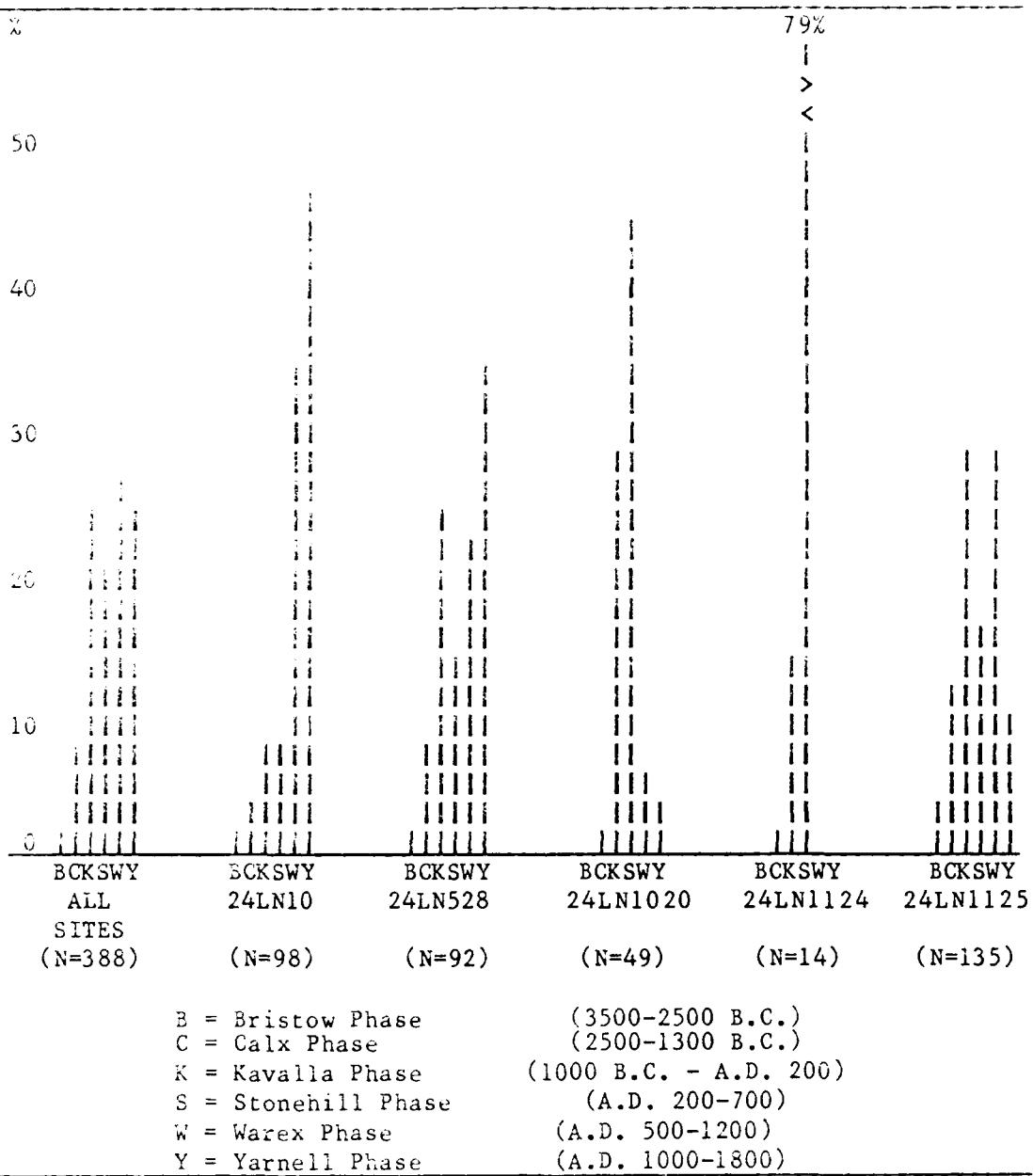


Figure 5.19. Percentage contribution of phase affiliated projectile points by total assemblage and by individual site.

#### External comparisons

The preceding culture-historical outline utilized typological cross-dating with the Northwestern Plains sequence because that area seems to show the greatest correspondence to the LAURD material inventory. In addition to the apparent correspondence in many artifact forms, the Northwestern Plains is the nearest area to the LAURD project that has been subjected to relatively consistent archaeological inquiry. Archaeological investigations that geographically surround the LAURD project have been undertaken

throughout the transmontane west and it is appropriate to compare those with the LAURD results. Small scale reconnaissance and testing programs such as those of Borden (1956) were important historically, but added little to cultural-historical interpretation.

Of the numerous synthetic statements that have been produced, those that were closest geographically to the LAURD area have been selected for comparison. These include Swanson's (1972) work in the Birch Creek Valley of Idaho (about 320 km south), Leonhardy and Rice (1970) on the Lower Snake River Region in Washington (350 km southwest), Turnbull (1977) on the Arrow Lakes along the Columbia River in British Columbia (160 km northwest), Chance, Chance, and Fagan (1977) and Chance (1972) at Kettle Falls in far eastern Washington (160 km west), Reeves' (1972) work in the Pass Creek Valley, Waterton National Park, southwestern Alberta (160 km east), and Reeves' (1969) synthesis of the Northwestern Plains (180 km east). Figure 5.20 illustrates the various archaeological constructs (phases, complexes, periods, etc.) identified and their temporal spans.

The different authors have utilized various devices to establish their cultural sequences and considerable elaboration would be required to relate the differences. The reader is referred to the original source for greater detail. Swanson (1972) established his sequences primarily on the basis of environmental episodes. Although many of Swanson's projectile points bear some morphological similarity to those from the LAURD project they are treated in a dramatically different fashion. Swanson is obviously convinced that the projectile point styles present in the Birch Creek Valley have very long temporal duration and that multiple styles co-exist but with periods of popularity and decline. As a result, most of the projectile point types identified by Swanson are not diagnostic of any single archaeological phase. It must be remembered that the Birch Creek sites were rock shelters, notorious settings for the transport of specimens both upward and downward throughout their sediments.

Swanson's (1972:66 and 67) quantifications of projectile point frequencies from the both Bison and Veratic rockshelters provide some revealing figures. The Birch Creek Phase contains 58% Birch Creek points, 13% lanceolate concave based points (Swanson's Plainview-McKean), 13% Bitterroot Side Notched, 1% corner notched, and 4% others. The Bitterroot Phase contained 7% Birch Creek points, 1% lanceolate concave base, 54% Bitterroot Side Notched, 5% corner notched, 11% others (7% of the total might be classified by Plains specialists as Duncan varieties), and 23% "Beaverhead preforms." Birch Creek points clearly dominate the Birch Creek Phase sediments with both the lanceolate concave base and Bitterroot forms as minor elements. The Bitterroot sediments are equally dominated by the Bitterroot point type; the only other point that appears in relatively high frequency is the Beaverhead preform, a form of questionable diagnostic purity.

In Swanson's Beaverhead Phase corner notched varieties account for 44% of the assemblage, 18% Bitterroot, 10% Birch Creek, and other forms relatively less frequently. The succeeding Blue Dome Phase is nearly overwhelmed by 64% corner notched forms with Beaverhead

preforms accounting for an additional 19%. The Blue Dome point and Bitterroot points each represent 6% of the projectile point assemblage. The terminal Lemhi Phase is the only phase to contain Desert Side Notched forms (51%). Points identified as Bitterroot represent 14% of the projectile point assemblage and the ubiquitous Beaverhead preform 33%.

The trend seems clear; the prevailing theme through time seems to be lanceolate Birch Creek and others to the Large Bitterroot Side Notched to corner notched to small side notched. Reeves (1973) has noted that Bitterroot points have long gone unidentified in the Northern Plains because of their similarity to late varieties present there. The corollary to Reeves' statement should also hold. I suspect the long temporal duration that the Bitterroot point type seems to exhibit at Birch Creek is more the result of typological uncertainty and questionable context than long term popularity.

Of major interest here is that the long lived Bitterroot Phase is typified by large side-notched projectile points that bear a resemblance to the Cold Springs points of the late Cascade Phase and presumably the late Slawntehus Period of the Lower Snake River and at Kettle Falls respectively. Similar large side-notched forms predominate in the Bellevue Hill Phase of the Pass Creek Valley and in the Mummy Cave Complex of the Northern Plains. While the time of origin and duration exhibit substantial difference among the constructs considered, there is also considerable overlap among them.

Stemmed projectile points seem to appear in various frequencies in the late Bitterroot Phase, they dominate the Tucannon and Ksunku Phases, and are identifiers of the Hanna, Blakiston Brook and the LAURD Calx Phases from around 2500 to 1000 B.C. The lanceolate Indented base McKean Type is apparently restricted to the more easterly early Calx, Bellevue Hill and McKean Phases. Turnbull (1977) notes that stemmed forms reminiscent of Lower Snake River Tucannon Phase varieties dominate the Arrow Lakes Deer Park Phase but that corner notched forms similar to those of the early Harder Phase are also present.

From about 1000 B.C. to A.D. 500 corner notched projectile points dominate the projectile point assemblages throughout the northern transmontane west. They occur in the Beaverhead and Blue Dome Phases of the Birch Creek sequence, the Harder Phase of the Lower Snake River region, the Deer Park Phase on the upper Columbia River Arrow Lakes, the Blue Slate Canyon and Pelican Lake Phases across the Rockies, and in the LAURD Kavalla Phase. From about A.D. 500-1000 to contact times a range of small arrow sized side-notched forms prevail in the Plains and northern Rockies, including the Rocky Mountain sections of Idaho. These are the dominant forms of the Lemhi Phase in the Birch Creek sequence, the Crandell Mountain and Pass Creek Valley Phases of the Pass Creek sequence, the Avonlea and Old Women's Phases of the Northwestern Plains, and the Warex and Yarnell Phases of the LAURD project. Avonlea or Avonlea-like varieties identify the Avonlea, Crandell Mountain and Warex Phases while the so-called Plains Side-notched forms prevail during the Old Women's, Pass Creek Valley and Yarnell Phases. During approximately the same time interval the small

Columbia Valley Corner Notched varieties prevail over much of the Columbia Plateau proper as elements of the late Harder, Piqúmin and Numipu Phases on the Lower Snake River, the Late Plateau and Historic Lake Periods of the Arrow Lakes, and late Takumakst and Shwayip Phases at Kettle Falls. Similar sized rectangular stemmed and side-notched forms appear in prominent, but less substantial, numbers in late archaeological manifestations throughout the Plateau west of the Rockies.

Examination of Figure 5.20 reveals some gross correlations between the LAURD sequence and others, particularly after 1000 B.C. As might be expected the manifestations identified appear at slightly different times and endure for greater or lesser time. At least four different environments prevail among the seven archaeological sequences that have been considered and each sequence contains evidence of the unique response to local conditions. Birch Creek is in the cool desert on the Pacific slope of the Northern Rocky Mountains. Here, faunal remains consist primarily of bison with mountain sheep, deer, pronghorn, and wapiti occurring in decreasing quantities. The Lower Snake River Region, Kettle Falls, and the Arrow Lakes are all in the Columbia Plateau with its anadromous fish resource and root crops as well as large mammals (deer, pronghorn, and, intermittently, bison) available for human sustenance. On the southern Columbia Plateau the configurations of resources and people were such that semi-sedentary settlements were established by 2500-2000 B.C. (Ames and Marshall 1980), and on the upper reaches of the Columbia River on the Arrow Lakes similar pit house settlements existed from about 1000 B.C. to A.D. 300 (Turnbull 1977) during the Deer Park Phase. The more easterly archaeological sequences seem to illustrate a continuation of a nomadic hunting or, in the case of the Kootenai Region, foraging lifestyle (the pit houses on Windemere and Columbia Lakes at the limits of anadromous fish migrations present an intriguing exception). In the Northwestern Plains, bison prevailed as a food source with supplements from a range of smaller mammals (again deer, wapiti, sheep, and pronghorn). The Pass Creek Valley shares many of the resources of the Plains since the valley opens directly onto the high Alberta Plain. It also shares many attributes with the forested Kootenai Region. The Kootenai Region contains only three of the resources mentioned for surrounding areas in any abundance: deer, wapiti, and mountain sheep.

Not too surprisingly, the greatest correspondence in impressionistic artifact configurations for the LAURD project lies with those from the Pass Creek Valley. Comparison of photographs of the Pass Creek collections with specimens from the LAURD project would seem to indicate that few specimens from one area would attract notice if surreptitiously placed in the other. Essentially all of the specimens from the LAURD collections are observable in the somewhat larger Pass Creek assemblages. All of the LAURD projectile points appear in the Pass Creek collections; some of the earlier Pass Creek points have not yet been observed in the LAURD area. Most other artifacts, from unifacial scrapers to "argillite knives" to bilaterally notched pebbles and scaled pieces, are observable in both collections (examples of selected tools from the LAURD assemblages are

illustrated in Figures 5.21 and 5.22). Were bison bone not a common element in the Pass Creek faunal assemblage the total assemblages (tools and faunal remains) would be virtually inseparable except on the closest of scrutiny.

	BIRCH <sup>1</sup> GREEK	LOWER <sup>2</sup> SNAKE RIVER	ARROW <sup>3</sup> LAKES	KETTLE <sup>4</sup> FALLS	LAURD	PASS <sup>5</sup> CREEK	NW <sup>6</sup> PLAINS
1450		NUMIPU	HISTORIC LAKE	SHWAYIP	YARNELL	PASS CREEK VALLEY	OLD WOMENS
	LEMHI	PIQUININ			WAREX	CRANDELL MOUNTAIN	AVONLEA BESANT
1000		LATE PLATEAU		TAKUMAKST	STONEHILL		
A.D. B.C.	SILIC DOME	HARDER			KAVALLA	BLUE SLATE CANYON	PELICAN LAKE
1000		DEER PARK PHASE					
	BEAVERHEAD				BLAKISTON BROOK	HANNA	
2000		TUCANNON	?	CALX		McKEAN	
			KSUNKU				
3000	BITTERROOT			BRISTOW		OXBOW	
4000		CASCADE		SLAWNTEHUS		MUMMY CAVE COMPLEX	
5000					?		
6000				SHONITKWU	VALLEY ENTRANCE	LUSK- FREDRIC COMPLEX	
	BIRCH GREEK				RED ROCK CANYON		
7000		WINDUST			LAKE LINNET II	CODY- ALBERTA COMPLEX	
8000					LAKE LINNET I	HELL GAP- AGATE BASIN COMPLEX	
9000						FOLSOM	

<sup>1</sup>(Swanson 1972), <sup>2</sup>(Leணard and Rice 1970), <sup>3</sup>(Turnbull 1977), <sup>4</sup>(Chance and others 1977, chance 1981), <sup>5</sup>(Reeves 1972 [modified]), <sup>6</sup>(Reeves 1969)

Figure 5.20. Selected archaeological sequences of the northern transmontane west.

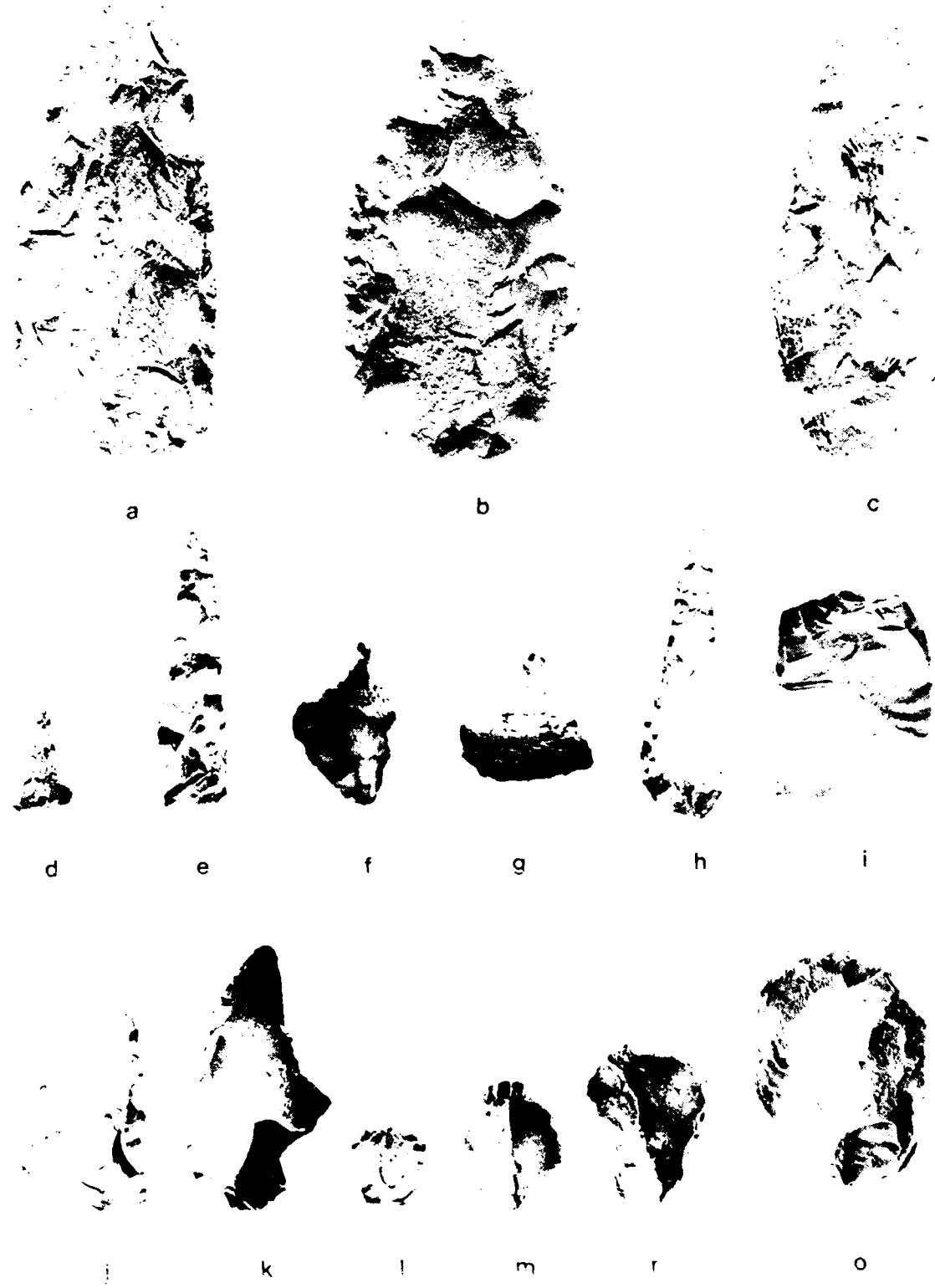


Figure 5.21. Miscellaneous tools from the 197 LAURD project sites. (a - c, pointed bifaces; d - h, perforators; i, scaled piece; j and k, side scrapers; l - o, endscrapers)(d and e, 24LN10; a, b, and i, 24LN528; c, f - h, and j - o, 24LN1125) (scale '1').



Figure 5.22. Miscellaneous tools from the 1979 LAURD project sites.  
(a and b, notched pieces; c, grooved maul; d, antler  
wedge; e, bone awl) (a - c, 24LN1125; d and e, 24LN528)  
(scale 1:1).

- Steward, Julian H.  
1955 Theory of culture change. University of Illinois Press, Urbana.
- Stewart, Frances L., and Peter W. Stahl  
1977 Cautionary note on edible meat poundage figures. American Antiquity 42(2):267-270.
- Stockmarr, J.  
1971 Tablets with spores used in absolute pollen analysis. Pollen et spores 13(4):615-621.
- Swanson, Earl H.  
1972 Birch Creek: human ecology in the cool desert of the Northern Rocky Mountains 9,000 B.C. - A.D. 1850. The Idaho State University Press, Pocatello.
- Taylor, Dee C.  
1973 Archaeological investigations in the Libby Reservoir area, Northwestern Montana. University of Montana Contributions to Anthropology No. 3.
- Taylor, Walter W.  
1948 A study of archaeology. American Anthropological Association Memoir No. 69.
- Thomas, David Hurst  
1981 A key to the post-Mazama projectile points of the central and western Great Basin. Paper submitted to the Journal of California and Great Basin Anthropology.
- Thwaites, Ruben Gold  
1959 Original journals of the Lewis and Clark expedition, 1804-1806, 7 vols. Antiquarian Press, New York.
- Turnbull, Christopher J.  
1977 Archaeology and ethnohistory in the Arrow Lakes, southeastern British Columbia. National Museum of Man Mercury Series, Archaeological Survey of Canada Paper No. 65.
- Turney-High, Harry H.  
1941 Ethnography of the Kutenai. American Anthropological Association Memoir No. 56.
- Tyrrell, J. B.  
1916 David Thompson's narrative of his explorations in western America, 1784-1812. The Champlain Society, Toronto.
- U. S. Environmental Data Service  
1975-1979 Climatological Data, Montana. Annual Summary 78(13).
- Waddington, J. C. B., and H. E. Wright  
1974 Late Quaternary vegetational changes on the east side of Yellowstone Park, Wyoming. Quaternary Research 4(2):175-184.

- Robinson, C. H.  
1968 Fundamentals of normal nutrition. The Macmillian Company, London.
- Roll, Tom E.  
1979 Additional archaeological assessment of the Fisher River Site (24LN10), Northwestern Montana. Archaeology in Montana 20(2):79-106.
- Roll, Tom E., and Marilyn J. Bailey  
1979 Archaeological investigations of selected recreation sites on Koocanusa Reservoir, Spring 1979. Report submitted to the Seattle District, U. S. Army Corps of Engineers.
- Roll, Tom E., and Marc B. Smith  
1982 The 1979 LAURD Cultural Resources Project: Descriptive Archaeology. Report submitted to the Seattle District, U. S. Army Corps of Engineers.
- Sapir, Edward  
1916 Time perspective in aboriginal American culture, a study in method. Geological Survey of Canada, No. 13, Memoir 90, Anthropological Series.
- Schaeffer, C. E.  
1936 Kutenai field notes, 1935, Vol.II. Typed manuscript on file at the American Museum of Natural History, New York.  
1940 The subsistence quest of the Kutenai. Unpublished doctoral dissertation. The University of Pennsylvania.
- Schmautz, J. E., and A. Zajanc  
1949 A study of white-tail deer population in the Fisher-Wolf Creek area. Montana Fish and Game Commission, Wildlife Restoration Division, Big Game Project Reports Western Montana, April-June 1949:1-24.
- Schroedl, Gerald F.  
1973 The archaeological occurrence of bison in the southern Plateau. Laboratory of Anthropology, Washington State University, Reports of Investigations 51.
- Shiner, J.  
1950 Archaeological resources in the Libby and Katka reservoirs, northern Idaho and northwestern Montana. Columbia Basin Project, River Basin Surveys, Smithsonian Institution, Washington
- State of Montana  
1981 Montana monthly labor force by county, current population survey data. Prepared by Research and Analysis Section, Employment and Security Division, Department of Labor and Industry, Helena.

- Mulloy, William T.  
1958 A preliminary historical outline for the Northwestern Plains. University of Wyoming Publications 22(1-2):1-235.
- Munsell, David A., and Lawr V. Salo  
1979 Libby Additional Units and Reregulating Dam, Kootenai River, Montana: comprehensive management plan. Seattle District, U. S. Army Corps of Engineers.
- Murray, Genevieve F. Allen  
1929 The bitter root in science and in history. Unpublished master's thesis. The University of Montana.
- Nero, R. W., and B. A. McCorquodale  
1958 Report of an excavation at the Oxbow Dam Site. The Blue Jay 16:82-90.
- Odum, Eugene P.  
1971 Fundamentals of ecology, (3rd Edition). W. B. Saunders, Philadelphia.
- Palmer, Edward  
1871 Food products of the North American Indians. U. S. Commission of Agriculture, Report, pp. 404-409.
- Pfister, R. C., B. L. Kovalchik, S. F. Arno, and R. C. Presby  
1977 Forest habitat types of Montana. U. S. Forest Service General Technical Report INT-34.
- Pianka, Eric R.  
1974 Evolutionary ecology. Harper and Row, New York.
- Reeves, B. O. K.  
1969 The southern Alberta paleocultural-paleoenvironmental sequence. In Post-Pleistocene man and his environment on the Northern Plains, edited by R. B. Forbis and others, pp.6-46. The Archaeological Association of the University of Calgary.
- 1970 Culture change on the Northern Plains, 1000 B.C. - 1000 A.D. Unpublished doctoral dissertation. The University of Calgary.
- 1972 The Archaeology of Pass Creek Valley, Waterton Lakes National Park. Manuscript on file, National and Historic Parks Branch, Ottawa.
- 1973 The concept of an altithermal cultural hiatus in Northern Plains prehistory. American Anthropologist 75(5):1221-1253.
- Richmond, G. M., R. Fryxell, G. E. Neff, and P. L. Weis  
1965 The Cordilleran ice sheet of the northern Rocky Mountains, and related Quaternary history of the Columbia Plateau. In The Quaternary history of the United States, edited by H. E. Wright and D. G. Frey, pp. 231-242. Princeton University Press, Princeton, N. J.

- Luedtke, Barbara E.  
1978 Chert sources and trace-element analysis. American Antiquity 43(3):413-423.
- Mack, R. N., V. M. Bryant, Jr., and W. Pell  
1978a Modern forest pollen spectra from eastern Washington and northern Idaho. Botanical Gazette 139(2):249-255.
- Mack, R. N., N. W. Rutter, V. W. Bryant, Jr., and S. Valastro  
1978b Late Quaternary pollen record from Big Meadow, Pend Oreille Co., Washington. Ecology 59:956-966.
- Mack, R. N., N. W. Rutter, V. W. Bryant, Jr., and S. Valastro  
1978c Reexamination of postglacial vegetational history in northern Idaho, Hager Pond, Bonner Co. Quaternary Research 10(2):241-255.
- Mack, R. N., N. W. Rutter, and S. Valastro  
1978d Late Quaternary pollen record from the Sanpoil River Valley, Washington. Canadian Journal of Botany 56(14):1642-1650.
- Maher, L. F., Jr.  
1972 Absolute pollen diagram of Redrock Lake, Boulder County, Colorado. Quaternary Research 2(4):531-553.
- Malouf, Carling I.  
1956 The cultural connections between the prehistoric inhabitants of the upper Missouri and Columbia River systems. Unpublished doctoral dissertation. Columbia University.
- May, Bruce, and Joe Huston  
1975 Status of fish populations in the Kootenai River below Libby Dam following regulation of the river. Final job report. Contract No. DACW67-73-C-003. Montana Department of Fish and Game.
- 1979 Status of fish populations in the Kootenai River below Libby Dam following regulation of the river. Final job report. Contract No. DACW67-76-C-0055.
- McKerr, W. C.  
1939 The Midwestern taxonomic method as an aid to archaeological culture study. American Antiquity 4:301-13.
- Mehring, Peter J., Jr., Stephen F. Arno, and Kenneth L. Petersen  
1977 Postglacial history of Lost Trail Pass Bog, Bitterroot Mountains, Montana. Arctic and Alpine Research 9(4):345-368.
- Morgan, Lawrence R.  
1978 Linguistic evidence for Kootenay prehistory: a preliminary report. In Waters of wealth: a seminar on the Kootenai region of the United States and Canada, edited by Jennifer Jeffries. Libby, Montana.

Jennings, Jesse D.

1974 Prehistory of North America (2nd Edition). McGraw-Hill, New York.

Jermann, Jerry V., and Stephen Aaberg

1976 Archaeological reconnaissance in the Libby Reservoir-Lake Koocanusa area, Northwestern Montana. Report submitted to the Seattle District, U. S. Army Corps of Engineers.

Johnson, Ann M.

1970 Montana projectile point types: Avonlea. Archaeology in Montana 11(1):45-57.

Keene, Arthur S.

1981 Prehistoric foraging in a temperate forest: a linear programming model. Academic Press, New York.

Kehoe, Thomas F.

1966 The small side-notched point system of the northwestern Plains. American Antiquity 31(6):827-841.

Kehoe, Thomas F., and Bruce McCorquodale

1961 The Avonlea point - horizon marker for the northwestern Plains. Plains Anthropologist 6(13):179-188.

Kroeber, A. L.

1963 Cultural and natural areas of native North America. University of California Press, Berkeley.

Kuhn, Thomas S.

1970 The structure of scientific revolutions (2nd Edition). International Encyclopedia of Unified Science II(2).

Lee, Richard B.

1968 What hunters do for a living, or, how to make out on scarce resources. In Man the hunter, edited by Richard B. Lee and Irven DeVore, pp.30-48. Aldine, Chicago.

Lee, Richard B., and Irven DeVore

1968 Man the hunter. Aldine, Chicago.

Leonhardy, Frank C., and David G. Rice

1970 A proposed culture typology for the lower Snake River Region, southeastern Washington. Northwest Anthropological Research Notes 4(1):1-29.

Long, Austin, and Bruce Rippeteau

1974 Testing contemporaneity and averaging radiocarbon dates. American Antiquity 39(2):205-215.

Lyman, R. L.

1979 Available meat from faunal remains: a consideration of techniques. American Antiquity 44(3):536-546.

- Fulton, Leonard A. (Cont.)  
1970 Spawning areas and abundance of Steelhead Trout and Coho, Sockeye, and Chum Salmon in the Columbia River Basin--past and present. U. S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Special Scientific Report--Fisheries No. 618.
- Gould, F. W.  
1942 A systematic treatment of the genus Camassia, Lindl. American Midland Naturalist 29:712-142.
- Graham, Patrick J.  
1979 Kootenai Falls aquatic environment study: final report. Report submitted to Northern Lights, Inc., and the Montana Department of Natural Resources and Conservation.
- Hansen, H. P.  
1943 Post-Pleistocene forest succession in northern Idaho. The American Midland Naturalist 30:796-802.  
1948 Postglacial forest succession, climate and chronology in the Pacific Northwest. Ecology 29:146-152.  
1949 Postglacial forests in west central Alberta, Canada. Bulletin of the Torrey Botanical Club 76:278-289.  
1952 Postglacial forests in the Grande Prairie-Lesser Slave Lake region of Alberta, Canada. Ecology 33:31-40.  
1955 Postglacial forests in south central and central British Columbia. American Journal of Science 253:640-658.
- Hart, Jeff  
1976 Montana - native plants and early peoples. The Montana Historical Society and the Montana Bicentennial Administration, Helena.
- Henry, Craig J.  
1979 The osteoarcheology of 24LN1036. Draft report submitted to the Seattle District, U. S. Army Corps of Engineers. Xeroxed.
- Heusser, C. J.  
1956 Postglacial environments in the Canadian Rocky Mountains. Ecological Monographs 26:263-302.
- Hodder, I., and C. Orton  
1976 Spatial analysis in archaeology. The University Press, Cambridge.
- Holder, Preston H.  
1966 Franz Boas, Introduction to Handbook of American Indian Languages. J. W. Powell, Indian Linguistic Families of America North of Mexico. University of Nebraska Press, Lincoln.

Choquette, Wayne (Cont.)

1974 Libby pondage archaeological salvage project: 1973 season.  
Report submitted to the Archaeological Sites Advisory Board of  
British Columbia.

1975 Kootenay lithic resources study: some observations. Paper  
presented at the 28th Annual Northwest Anthropological  
Conference, Seattle, WA.

1978 An alternative cultural resources management plan for the  
Libby Auxilliary Units and Reregulating Dam. In L.A.U.R.D.  
Cultural Resources Management Plan, Wayne Choquette, David G.  
Rice, and Roderick Sprague. Draft report submitted to the  
Seattle District, U. S. Army Corps of Engineers. Xeroxed.

1980 Some results of excavation of a Late Prehistoric camp on  
the Kootenai River. Paper presented to the 1980 annual  
meeting of the Montana Archaeological Society, Missoula.

Choquette, Wayne, and Craig Holstine

1980 A cultural resource overview of the Bonneville Power  
Administration's proposed transmission line from Libby Dam,  
Montana to Rathdrum, Idaho. Washington Archaeological Research  
Center Project Report No. 100. Pullman.

Clarke, David L.

1977 Spatial archaeology. Academic Press, London.

Damon, P. E., C. W. Ferguson, A. Long, and E. I. Wallick

1974 Dendrochronologic calibration of the radiocarbon time  
scale. American Antiquity 38(2):350-366.

Daubenmire, R., and J. B. Daubenmire

1968 Forest vegetation of eastern Washington and northern  
Idaho. Washington Agricultural Experiment Station Technical  
Bulletin 60. Pullman.

Davis, Leslie B.

1966 Avonlea point occurrence in northern Montana and Canada.  
Plains Anthropologist 11(32):100-116.

1982 Montana archaeology and radiocarbon chronology:1962-1981.  
Archaeology in Montana, Special Issue No. 3.

Faegri, Knut, and Johs. Iversen

1964 Textbook of pollen analysis. Hafner, New York.

Fulton, Leonard A.

1968 Spawning areas and abundance of Chinook Salmon  
(Oncorhynchus tshawytscha) in the Columbia River Basin--past  
and present. U. S. Fish and Wildlife Service Special  
Scientific Report--Fisheries No. 571.

- Blair, R. B.  
1955 Impact of the proposed Libby Dam upon the wildlife resources of Lincoln County, Montana. Montana Dept. of Fish and Game Investigations Project W-36-R.
- Bonde, Thomas J., and Ronald M. Bush  
1975 Kootenai River water quality investigations: Libby Dam preimpoundment study, 1967-1972. Report prepared by the Seattle District, U. S. Army Corps of Engineers.
- Borden, Charles E.  
1956 Results of two archaeological surveys in the east Kootenai region of British Columbia. Research Studies, State College of Washington, 24:73-104.
- Burt, W. H., and R. P. Grossenheider  
1976 A field guide to the mammals. Houghton Mifflin, Boston.
- Bryant, Floyd G., and Zell E. Parkhurst  
1950 Survey of the Columbia River and its tributaries; Part IV. U. S. Fish and Wildlife Service Special Scientific Report: Fisheries 37.
- Caldwell, Warren W., and Oscar L. Mallory  
1967 Hells Canyon archaeology. Smithsonian Institution, River Basin Surveys, Publications in Salvage Archeology No. 6. Lincoln.
- Chance, David H.  
1982 The Slawntehus Period in Kettle Falls-Upper Columbia prehistory. Paper presented at the 35th annual Northwest Anthropological Conference, Simon Fraser University, Burnaby, B.C., Canada.
- Chance, David H., Jennifer V. Chance and John L. Fagan  
1977 Kettle Falls:1972 salvage excavations in Lake Roosevelt. University of Idaho Anthropological Research Manuscript Series No. 31.
- Chang, K. C.  
1967 Rethinking archaeology. Random House, New York.
- Choquette, Wayne  
1971 Archaeological salvage operations within the Libby Dam pondage, 1971. Report submitted to the Archaeological Sites Advisory Board of British Columbia.  
1972 Preliminary report, Libby Reservoir Archaeological Salvage Project. Report submitted to the Archaeological Sites Advisory Board of British Columbia.
- 1973 Archaeological site survey in the Kootenay River drainage region, 1972. Report submitted to the Archaeological Sites Advisory Board of British Columbia.

REFERENCES CITED

- Aaberg, Stephen A.  
1981 Plant gathering as a settlement determinant at the Pilgrim Stone Circle Site. Paper presented at the 1981 Annual Plains conference.
- Adams, C. F.  
1975 Nutritive value of American foods, in common units. U. S. Dept. of Agriculture, Handbook No. 456.
- Alden, W. C.  
1953 Physiography and glacial geology of western Montana and adjacent areas. U. S. Geological Survey Professional Paper 231.
- Ames, Kenneth M., and Alan G. Marshall  
1980 Villages, demography and subsistence intensification on the southern Columbia Plateau. North American Archaeologist 2(1):25-52.
- Baker, R. C.  
1976 Late Quaternary vegetation history of the Yellowstone Lake Basin, Wyoming. United States Geological Survey Professional Paper 729-E.
- Banfield, A. W. F.  
1974 The mammals of Canada. University of Toronto Press, Toronto.
- Barrett, Stephen W.  
1981 Relationship of Indian-caused fires to the ecology of western Montana forests. U.S.D.A. Forest Service, Northern Region, Report No. 4.
- Beardsley, R. K., P. Holder, A. D. Krieger, B. J. Meggars, J. B. Rinaldo, and P. Kutschie  
1956 Functional and evolutionary implications of community patterning. In "Seminars in Archaeology, 1955", edited by R. Wauchope, pp. 129-157. Memoirs of the Society for American Archaeology 11.
- Binford, Lewis R.  
1972 Hatchery West: site definition - surface distribution of cultural items, In An archaeological perspective, Lewis R. Binford, pp.164-181. Seminar Press, New York.
- 1978 Nunamiut ethnoarchaeology. Academic Press, New York.
- 1980 Willow smoke and dogs' tails: hunter-gatherer settlement. American Antiquity 45(1):4-20.

We prefer the interpretation that human utilization of the LAURD project area increased. We examined a sufficient number of buried terrace surfaces that would have been available for occupancy at earlier times that contained either sparse evidence or no indication of human habitation. Comparatively intensive (for the LAURD area), though probably intermittent, occupation was instituted by 1500 B.C. and continued into ethnographic times.

At long last the archaeological community has had the chance to examine the subsurficial nature of Kootenai River archaeological sites. Even though we have sampled only a segment of the total river valley it is a beginning. Here we have an unparalleled research opportunity to investigate the advantages and limitations of collector adaptations in a mountainous, temperate coniferous forest setting. In an even broader context the area may contribute basic insights into the nature of particular kinds of adaptations and culture change. This has been the value of the LAURD project. The Kootenai River Region has proved significant as a geographic area in which the limits on seasonal sedentism and aggregation of human populations were established. These margins are now better understood in their own terms as a result of our efforts in the LAURD archaeological project.

the models we generated earlier against the data recovered to date and discard those that obviously do not fit. Beyond that, we can use what data we have generated, and a number of conclusions we have made from that, to modify other models and offer them for consideration by future workers in the region. We expect, in fact we hope, that future investigators will view these models as naive and overly simplistic, crude approximations to revise, expand, or reject as the evidentiary base increases.

We feel we may safely discard the application of the eclectic gatherer-hunter model developed by Yellen (1977) from !Kung San data. The extreme seasonal variability of resource availability and the probable need to collect and store food for the winter effectively preclude an uncritical application of Yellen's model.

We likewise feel that intercept hunting strategies (Binford 1978) such as those used by the Nunamiat Eskimo during the caribou migration would provide a poor analogue for the taking of deer and other game on the Kootenai. We suspect that fishing may have occupied a more prominent position in the prehistoric subsistence quest than either the faunal evidence or modern fish densities indicate. Perhaps fish represent a critical resource rather than a staple. Finally, we do not discount the potential that small game, such as the ubiquitous Columbia ground squirrel, may offer as a dietary item. Fish, fowl, and small mammals, if roasted and eaten whole, could support substantial human populations and leave virtually no trace of their role in the prehistoric diet.

The subsistence quest seems little altered over the 3500 years well documented in the Kootenai Canyon locality. Where the particular resource was acquired and the manner of procurement may have changed, but the species utilized probably remained much the same. The palynological record identifies major periods of climatic fluctuation as indicated by alterations in the plant communities. Despite alternating periods that were both warmer and drier and colder and moister than at present, the extent of change does not appear sufficient to dramatically affect the composition of indigenous animal species utilized by humans during the last 3500 years. Artiodactyls (deer, wapiti, and sheep) dominate the faunal remains from excavated archaeological sites. The versatility of the identified artiodactyls, as well as the other utilized animal species, is sufficiently great that they would be little affected by the indicated climatic-vegetative changes. The diverse topography of the Kootenai Canyon locality would probably provide habitat similar to that available today but at somewhat different elevations or exposures.

On the basis of typological cross-dating it appears that the earliest identified occupation in the LAURD project area (based on 1979 excavations) began after the deposition of the Mazama Ash (<4700 B.C.). The paucity of specimens before 1500 B.C. must be indicative of either infrequent occupancy, small population size, upland orientation, or destruction of evidence by geomorphic processes. After 1500 B.C. intensity of occupation, indicated by frequency of projectile point occurrence, either increased or erosion by geomorphic processes decreased.

Human populations must have dispersed throughout the Kootenai Region during other seasons to exploit their principal prey, the deer, and other seasonally abundant resources such as spawning freshwater fish, root resources, berries, and a variety of birds and mammals. The record of human occupancy seems to reveal a record of increasing effectiveness in exploiting the seasonally variable and never overly abundant resource base of the Kootenai River Region. Certainly, such a model does not conflict with the evidence we have uncovered to date. At best, an overly simplistic reconstruction such as that suggested represents only one of a series of multiple working hypotheses, any one of which would adequately account for these data.

We must, however, recognize the limitations of our data base. In the first place, we only excavated at eight sites. One of the sites (24N1123) received a minimal test and we probably have acquired insufficient knowledge of at least two other major sites (24LN10 and 528). In addition, the University of Idaho excavated one other site (24LN1036) and tested an additional 28. In all, archaeological endeavors over the last 30 years have located 43 prehistoric sites within the proposed impact area of the LAURD project. Work farther upstream has located an additional 28 sites within the pool level of Lake Koocanusa (Jermann and Aaberg 1976, Taylor 1973, Roll and Bailey 1979). As a result of work during the spring of 1976 Jermann and Aaberg (1976) estimated that the United States portion of Lake Koocanusa contained approximately 400 sites. Choquette (1971, 1972, 1974) listed an additional 35 sites in the Canadian portion of the Koocanusa pool and another eight sites in the immediate vicinity (cf. Borden 1956).

To date, archaeologists have identified approximately 152 prehistoric sites in or adjacent to the main valley of the Kootenai River between the reregulating dam site and the Kootenai headwaters in British Columbia. Despite the impressively large number of sites, comparatively little information concerning these sites exists. Most of the sites identified prior to dam construction were located on modern floodplains. At present, archaeological tests and excavations have included only one site above the floodplain. Fewer than 10 sites have yielded adequate data for analysis; all but one (24LN1124) lie in the modern floodplain.

In other words, virtually all of the archaeological work to date has concentrated on one ecological zone within the Kootenai valley. From surveys of the present Koocanusa reservoir (Jermann and Aaberg 1976, Roll and Bailey 1979) we have indications that prehistoric utilization of the floodplain zone differed from that of the other zones. We do not know to what extent river bottom utilization differed from that of the other zones such as the higher terraces, tributary creek valleys, and forest or meadow highlands. We do not know the relative intensity of exploitation in those yet undefined ecological zones, nor do we really know the effective territory that groups using the Kootenai valley utilized.

Given these problems, it becomes difficult, if not impossible, to formulate a concise, inclusive model for prehistoric utilization of the Kootenai River valley and its surrounding environs. We can test

## 6. EPILOGUE

by

Tom E. Roll and William L. Singleton

This epilogue is the closing statement of our involvement with the LAURD Cultural Resources Project. Much of what needs to be said has already been said, but some synopsis or evaluation is necessary. We started in the Introduction by presenting a series of models to be considered in evaluating the subsistence-settlement system of the Canyon Locality. These it would seem must be reconsidered.

Pointed bifaces (projectile points and knives in traditional terminology) comprised the most abundant class of tools ( $N=817$ ) recovered during the 1979 LAURD project. The next most common classes consist of retouched pieces ( $N=543$ ) and scrapers ( $N=318$ ). The predominance of artifacts generally regarded as hunting implements lends credence to the supposition that large game hunting dominated the economic activities along the Kootenai valley bottoms. The fact that faunal analysis ascribed over 90 percent of all identifiable faunal remains to deer further supports this conclusion.

Uncritical application of these data might lead to the conclusion that the prehistoric Kootenai valley inhabitants were specialized deer hunters who indulged in very few other archaeologically visible economic activities. The faunal remains also clearly indicate that some (if not all) habitation occurred during the winter months, when deer populations reach concentrations of up to  $50/\text{km}^2$  (Schmautz and Zajanc 1949) in specific nearby areas. Furthermore, of the nearly half million pieces of bone, bird bones occurred infrequently and only six identifiable fish bones appeared in the sample. All of this points to a closely focused exploitative strategy for sites in the valley bottoms.

We submitted to the temptation to develop a model for prehistoric human utilization of the Kootenai valley. The subsistence base throughout the approximately 3500 years of well documented human occupation within the LAURD project area arguably focused on the most abundant and efficient resource for prehistoric hunters in this region -- deer. The faunal analysis identified additional mammalian sources of food, but deer and deer-sized artiodactyls dominate the faunal assemblage by at least nine deer to all other mammals combined. If the remains had permitted more precise identification we suspect that the ratio of deer to other animals would have been higher. When the behavior of deer is taken into account (winter aggregation in river bottom parks, summer dispersal throughout the range) we must conclude that the principal occupation of the LAURD area must have taken place between late fall and early spring.

## Summary

The six phases discussed for the Kootenai Locality span nearly 6,000 years of Kootenai Canyon Locality prehistory. Throughout that timespan there are, at present, few substantial changes visible in either subsistence or technology. The most immediately observable changes are those associated with projectile point form. There is a suggestion of gradual accretion of some elements, such as the notched pebbles with the Kavalla Phase, but the associations are not firmly established. The association of edge abraded cobbles with Bristow Phase and possibly with pre-Bristow elements identified in surface collections from the Lake Koocanusa shoreline seems probable but must await verification from excavated contexts. The introduction of the bow and arrow with the Warex Phase seems to represent a prominent technological innovation but the rapidity with which they replaced the atlatl and dart (and if they did) remains an important consideration. Another avenue that has received little attention is the possibility that different projectile point forms served different, but contemporaneous, purposes. The presently available LAURD data are inadequate to test most of these possibilities.

Identification of subtle alterations in the form, technology of production, or technology of use of other tool types such as the non-projectile point bifacial tool inventory (knives, drills, perforators, and others) or the unifacial tools (side scrapers, end scrapers, scaled pieces, gravers, and retouched pieces) might provide reliable indicators of cultural change. Identification of such indicators will require specimens acquired from unquestionable contexts; mixed or disturbed deposits so frequently found in mountainous settings will only add additional "noise" to an already confusing issue. In surrounding areas where dramatically more archaeology has been undertaken such indicators are rarely identified. (This does not mean the task is impossible, only difficult.) In general there appears to be an accretion of elements with little loss or replacement. Most culture-historical schemes that deal with preceramic settings are, in the final analysis, based on changes in projectile point morphology.

The subsistence quest seems little altered over the 6000 years documented in the Kootenai Canyon Locality. Where the particular resource was acquired and the manner of procurement may have changed, but the species utilized probably remained much the same. The palynological record identifies major periods of climatic fluctuation as indicated by alterations in the plant communities. Despite alternating periods that were both warmer and drier and colder and moister than at present, the extent of change does not appear sufficient to dramatically affect the composition of indigenous animal species utilized by humans during the last 6000 years. Artiodactyls (deer, wapiti, and sheep) dominate the faunal remains from excavated archaeological sites. In all instances, deer are the prevalent species. The versatility of the identified artiodactyls, as well as the other utilized animal species, is sufficiently great that they would be little affected by the indicated climatic-vegetative changes. The diverse topography of the Kootenai Canyon Locality would probably provide habitat similar to that available today but at somewhat different elevations or exposures.

- Wettlaufer, Boyd  
1960 The finds. In, "The Long Creek Site," edited by W. J. Mayer-Oaks. Saskatchewan Museum of Natural History Anthropological Series No. 2.
- Whallon, Robert, Jr.  
1973 Spatial analysis of occupation floors I: application of dimensional analysis of variance. American Antiquity 38(3):266-278.
- 1974 Spatial analysis of occupation floors II: the application of nearest neighbor analysis. American Antiquity 39(1):16-34.
- Wheeler, Richard P.  
1954 Two new projectile point types: Duncan and Hanna points. Plains Anthropologist 1(1):7-14.
- White, Catherine M.  
1950 David Thompson's journals relating to Montana and adjacent regions: 1808-1812. Montana State University Press, Missoula.
- White, T. E.  
1953 Observations on the butchering technique of some aboriginal peoples No 2. American Antiquity 19(2):160-164.
- Willey, Gordon R.  
1966 Introduction to North American archaeology. Vol. 1: North and Middle America. Prentice-Hall, Englewood Cliffs.
- Willey, Gordon R., and Phillip Phillips  
1958 Method and theory in American archaeology. The University of Chicago Press, Chicago.
- Wissler, Clark  
1917 The American Indian. Douglas C. McMurtrie, New York.
- Yellen, John E.  
1977 Archaeological approaches to the present: models for reconstructing the past. Academic Press, New York.
- Zajanc, A.  
1948 Kootenai Unit: Lincoln County Game Study 1947-1948. Montana Fish and Game Commission, Wildlife Restoration Division Quarterly Report, April-June 1948:4-55.
- Ziegler, Allan C.  
1973 Inference from prehistoric faunal remains. Addison-Wesley Module in Anthropology No. 43.

**END**

**FILMED**

**5-85**

**DTIC**